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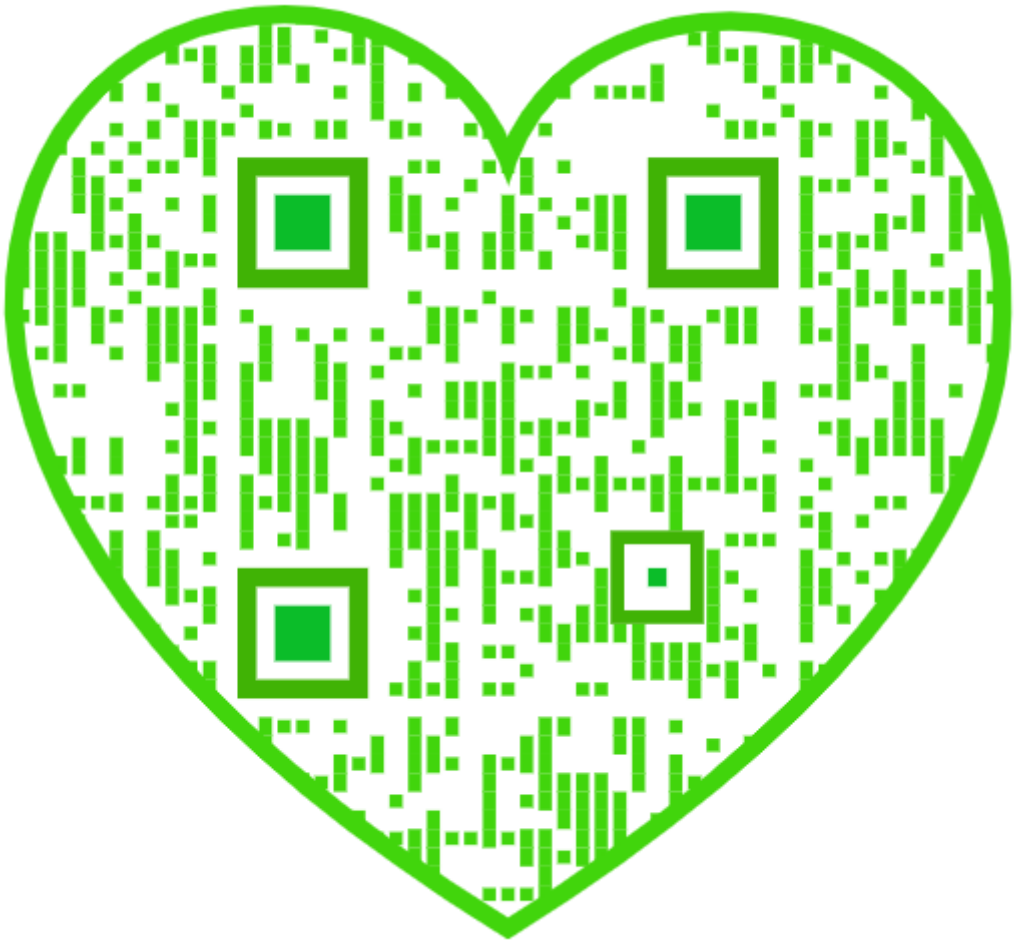

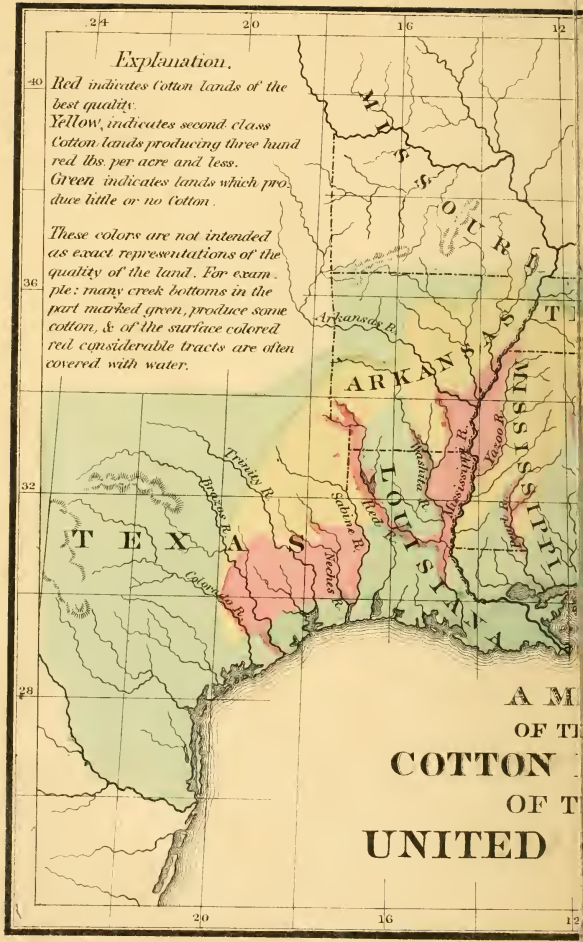
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Explanation.
Red indicates Cotton lands of the best quality.
Yellow, indicates second class Cotton lands producing three hundred lbs. per acre and less.
Green indicates lands which produce little or no Cotton.
These colors are not intended as exact representations of the quality of the land. For example: many creek bottoms in the part marked green, produce some cotton, & of the surface colored red considerable tracts are often covered with water.
MISSOURI
ARKANSAS
MISSISSIPPI
LOUISIANA
TEXAS
Arkansas R.
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Mississippi R.
Yazoo R.
Trinity R.
Brazos R.
Sabine R.
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COTTON CULTURE.

BY

JOSEPH B. LYMAN,

LATE OF LOUISIANA.

WITH AN ADDITIONAL CHAPTER ON

COTTON SEED AND ITS USES.

BY

J. R. SYPHER.

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PREFACE.

This Treatise is not a compilation.

Agricultural literature is by no means so rich in valuable works on the Cotton Plant, that it is possible to select from existing writings the information which, however skillfully grouped, can make an excellent book.

Twelve years of experience among the cotton growers of the Southwest have been found by the author of vastly more importance to the proper understanding of the whole subject, than all which has been written.

Of what has been before given to the world on the subject, I have found no matter more valuable than the letters of Dr. Cloud, of Alabama, who did more for the true and scientific culture of the plant, than all the other Southern writers put together.

His views, and those of that Bayou Sara planter who wrote an admirable letter to De Bow's Review on the Cotton-worm, have been freely quoted. Some useful statistics are to be found in the New American Cyclopædia, under the head of Cotton, and these, as well as other tables, have been studied. The writer would also express his obligations to Mr. Edward Atkinson, of Boston, whose lecture before the Geographical Society of New York is rich in valuable conclusions.

But whatever is of most worth in the pages that follow, is the result of personal observation, and of frequent and lengthy conversations with the most successful and the most intelligent cultivators of the great staple.

A TREATISE ON COTTON CULTURE.

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A TREATISE ON COTTON CULTURE.

PART I.

WHERE AND HOW THE PLANT IS RAISED.—A SERIES OF PRACTICAL DIRECTIONS AS TO THE ESTABLISHED ANNUAL ROUTINE IN COTTON PLANTING.

CHAPTER I.

THE COTTON FARM; ITS STOCK, IMPLEMENTS AND LABORERS.

Two general considerations must be regarded in approaching the business of cotton producing; one that of climate, the other of the soil.

The natural demands of the plants are for a tropical or semi-tropical climate that affords seven or eight months entirely secure from frosts. In the United States cotton is produced in all the belt that reaches from 40° north latitude to the Gulf of Mexico. A line drawn westward from Philadelphia divides that part of the country where cotton will, in various degrees, reward the labor of cultivation from those where its production is hopeless.

But in the upper part of that belt, between 36° and 40°, it is an exotic, more than half its productive power being

entirely cut away by a damp and chilly April, and a frosty October. The superiority of the lands of the Southern States of North America is due less to soil than to climate. In the relations of the mountains to the sea and of the Great Valley to the Gulf, into which its waters pour, is to be found the true secret of the rapid ascent of cotton to a great commercial and political power. This was very aptly stated by a recent lecturer before the American Geographical Society in terms substantially as follows:

"The peculiar climate of the Cotton States I understand to be produced by the chain of mountains which intersects our country, the lower spurs of the Alleghany range passing off westward in the hills of northern Georgia, Alabama, and Mississippi.

"On these the moisture brought inland by the sea-breezes from the Gulf and Gulf-stream is condensed, and falls in many showers, but not often in long storms; these showers occur frequently in spring, but rarely in midsummer and autumn, thus giving dry seasons for gathering the crop. After it has attained a vigorous growth, the cotton plant may defy the drouth, for by means of a long tap-root it lives upon the moisture accumulated beneath the surface during the winter and spring rains."

A line drawn from Raleigh westward through Nashville, and continued into the northern part of Arkansas has, until of late, been regarded as the true northern limit of the cotton belt, south of which it is, even at ten cents a pound, the most valuable crop that can be produced.

There are some good cotton lands in North Carolina, but that State has never been a large producer of the staple. Many of its river bottoms are too wet and heavy, and most of its uplands are too poor.

West of the mountains very little has ever been grown in the valleys of the upper Tennessee. But descending that tortuous stream, and passing west of Chattanooga into northern Alabama and western Tennessee, we come into

a region quite favorable to its growth, and in the section lying between the Tennessee and Cumberland, and drained by the Duck and Elk rivers, it has, in about half the counties, been for many years the staple.

In the northern part of those valleys, below Fort Donelson, its production gives place to tobacco. With the exception of these parts of Tennessee, and the south-eastern half of Arkansas, the Cotton States all touch the ocean or the Gulf. The thirty-second degree, or a line drawn across the Gulf States through Montgomery and Jackson, is the centre of the cotton belt. For a hundred miles each side of that parallel, north and south, and especially in the lands bordering on the lower half of all the affluents of the Gulf and the southern tributaries of the Mississippi, cotton is produced to an extent, and of a quality surpassed by no other equal area of the earth's surface. This is its natural home; here is its chosen domain. For cotton is essentially a child of the sun. It does not rejoice in copious moisture, and can thrive and come to perfection on less rain than any plant cultivated on the continent.

There are three classes of soil well suited to cotton. First, the soft argillaceous limestone, or what is called the rotten limestone and red lands of Georgia, South Carolina, parts of Alabama and Mississippi, and a small part of Texas.

This description of soil is soft, fine and friable, easily washed away, nearly, and in many parts entirely free from stones. The descents to streams are steep, but, in general, such soil is spread over an undulating surface, about half of which should be protected from washing by the winter rains with a system of circle ditching or circle ploughing. The growth on such lands is beech, magnolia, white and red oak, and some pine on the swells, with gum and enormous poplars on the creek bottoms. From 1840 to 1850 probably two-thirds or three-fourths of all the cotton produced grew on land of this description. For the ten years

preceding the war, there was a strong tendency among all the cotton planters to transfer their labor to alluvial lands.

The second class of cotton soils are the rich black canebrake lands of middle Alabama and the black rolling prairies of Texas. These are generally called the black lands, and cannot be surpassed by any alluvions for the certainty with which they produce crops, their freedom from destructive vermin, the admirable roll of the surface just sufficient for drainage, and the completeness with which every square yard of the soil may be turned under the plow. In winter, the roads through this class of lands become immense black mortar beds, where a loaded wagon sinks nearly to the axle, and six mules can hardly pull four bales, but in spring these formidable sloughs harden, and become polished under the wheel, so as to afford for eight months of the year a road as firm, smooth, and agreeable as it is horrible during the remaining four.

Another discount on these regions is the badness of the water. In general, however, such lands are considered worth twice as much as the former or red hill countries. In 1860 the price of the former ranged from ten to thirty dollars per acre, according to the degree to which they were washed or exhausted, nearness to markets and towns, excellence of buildings, and state of fences.

The black lands of middle Alabama, between the Tombigbee and the Alabama rivers, were seldom sold at less than fifty dollars, and the price ranged from that to one hundred. Now, (1867,) large surfaces are in market at about half the price they commanded before the war.

The alluvions or river bottoms are the third and most valuable class of cotton lands. Like river bottoms everywhere, the valleys of the Santee, the Chattahoochee, the Alabama and Tombigbee, the Pearl, and, beyond all, the vast areas drained by the Mississippi and its lower tributaries have very little inclination, and that little is gener-

ally away from the bank rather than towards the stream. But the soil is admirably adapted to cotton and the underdrain is such as to compensate for the flatness. Successive overflows have deposited an exhaustless bed of vegetable mould, mixed with fine sand and wash from the hills, through which the falling rains easily pass to a porous subsoil.

In dry seasons, a copious dew, which is rapidly evaporated by the hot morning sun, drenches the plants. The low lands are covered by a heavy growth of gum, magnolia, poplar and cypress, with, in many places, a thick undergrowth of cane. The labor of clearing, and the vegetable miasms of swamp lands, render them less desirable for permanent residence than the two classes above described, but their exhaustless fertility, and the ease with which great crops can be marketed, the steamboat in thousands of cases coming within a few hundred yards of the gin house, can but form a very strong attraction to every enterprizing cultivator. In 1860, the general price of bottom lands, cleared, cultivated, and safe from overflow, was one hundred dollars per acre.

Suppose now a person has a capital that enables him to possess and cultivate a cotton farm of two hundred acres, about half of which he proposes to put in cotton, the remainder being devoted to corn, vegetable garden, pasture, and woodland. What stock and implements, and what number of laborers should he have?

Of draft animals, his principal demand is for mules or horses. Oxen are too slow and heavy for the business, unless it be in the fall, in hauling long distances to market or a shipping point. It is desirable also that his mules be of medium size, and remarkable for *a fast walk* above every other quality. The cultivation of cotton requires rapid movement rather than strength. Except in opening heavy timbered land, weight of bone, either in animals or laborers, is unnecessary and frequently objectionable.

Moderate sized mules, rather long-legged, hardy, and not great eaters, are the best on a plantation.

On account of their greater freedom of movement, horses are a little superior to mules, but they are more apt to break down in the long hot days of June and July, when they must be constantly in the traces.

A mule to every ten acres in cotton is no more than a proper allowance. On the place supposed, ten mules is the complement. Of plows there will be required two kinds, one for breaking up and forming the beds, the other for subsequent cultivation. Heavy plowing is seldom called for on a cotton farm, and as an anomaly in agriculture, deep plowing between the rows has been found positively injurious. The reason is this: deep cultivation on many soils tends to develop a rank growth of the plant, and to retard the early opening of bolls; and cotton can be successfully grown only by a treatment that pushes the plant to an early maturity. For preparing the land, four or five large plows will be required. These should be rather broad than deep, with the moulding board well rolled over.

Eight or more small plows will be used in the cultivation. By small plows is meant those which make a light furrow, and their form will be discussed in a following chapter. Ten hoes will be needed, and three or four small light harrows.

Arrangements for harvesting the crop and hauling to market vary so much with the distances from the gin house and the shipping point, that no directions can be given that will be of universal application. The planter of one hundred acres may need no high box wagons for bringing in seed cotton from the field, and his gin house may be so near a stream that the bales can be rolled directly from the shed to the deck of a steamer. Under advantageous circumstances, a single four-wheeled wagon will suffice for the hauling of a place such as we suppose.

But in the great majority of situations at least two large wagons will be found necessary.

A gin house with machinery for grinding corn is almost a prime necessity. But this may be erected in the interval between laying aside the crop and the picking season. August is not generally a very busy month on a cotton farm.

As to the laborers on a place of the size supposed, ten hands is the average; one hand to ten acres in cotton. Unless the surface is uncommonly rough, and the season unfavorable, a good hand can take proper care of ten acres in cotton, and five in corn, besides having some time in the garden. But in the picking season, it is very desirable to put two or three more hands into the field. If your land is a rich bottom, it may produce six hundred pounds, or a bale and a half of ginned cotton to the acre, and it is a very smart picker that can get out fifteen bales in a season. Ten bales to the hand is always good work. In employing laborers, regard should be had chiefly to their capacity as cotton pickers, and here the difference is astonishing. Two men will work together all the year, a match for each other in chopping, splitting rails, plowing, hoeing and harvesting corn, yet in September, when they go into the cotton field with sacks on their shoulders, one will bring out two hundred pounds, and the other one hundred. One is naturally quick in his motions, and the other, though a faithful laborer and equally assiduous, cannot "get the knack of it," and though, by the stimulus of extra wages, he may come up to a hundred and fifty, and in the best picking to two hundred, he will never overtake his comrade.

In this respect, women are better than men; as a rule they make the best pickers. The work is light, though monotonous. The most of cotton is from three to four feet high, and many bolls are but a few inches from the ground, hence a tall person works at a disadvantage. A man about five feet six inches, or five feet eight inches,

compactly built, is likely to be the most valuable on a cotton farm, because he will prove a faster picker than an athletic man of brawny frame and large muscles.

It is very desirable also to hire laborers that are accustomed to cotton, and particularly such as are skillful with the plow. A man that understands circle plowing, on a hill place, that can carry his scooter, his sweep, or his cultivator within two inches of a row of young plants, yet never break or uproot one, and who can pick rapidly in the fall, is worth a hundred dollars a year more than one who understands nothing but corn or wheat and tobacco, though the latter may be the more able bodied man of the two.

Care should be taken to have an abundance of milk. No drink is so grateful to the heated laborer, who passes the whole day from dawn to sunset between the rows, as buttermilk. The curd it contains is nourishing, and the acid cooling. Milk in every form in which it can be taken, is admirably suited to the farm laborer, and in stocking a cotton farm, a cow to every three or four persons should be provided.

CHAPTER II.

PREPARATION OF THE SOIL AND PLANTING.

The plows should be started just as early in the spring as the season will permit. In the latter part of February, the ground in the hill country and red lands will often be found dry enough. The same is true of the bottom lands in the latitude of Vicksburg, and in the southern counties of South Carolina and Georgia. In general, it may be said that the direct preparation for a crop commences with February. The first plowing depends somewhat upon the

crop of the previous year. If the breadth was planted in cotton, all that is necessary is to keep a hand or two in advance of the plow, with hoes or clubs, to break down the old cotton stalks, or pull them up by the roots, and throw them into piles for burning. If the growth is not very rank they had better be plowed in, but in rich bottoms, where it sometimes attains the height of six or eight feet, the large branching stalks are unmanageable, and had better be burned. Where cotton was the previous crop, and no change in the width of the rows is desirable, run a small furrow between the ridges, then let the large plow pass on the middle of the slope of each row or ridge, and throw furrows from each side that will lap, so that what was a "middle" last year shall be a row this year, and *vice versa*. Where the previous crop was corn, and it becomes necessary to change the width of the rows, and where the land has been lying out, and is covered with tall weeds and sedge grass, a different course is to be pursued. The rows or beds are laid off by running shallow furrows at the proper distances apart. These distances are to be determined by the nature of the soil, say five and a half or six feet, and sometimes seven on very strong bottom lands, and four or four and a half on light lands. A good plan on stubble, corn, or fallow land, is to lay off the rows with a scooter, (a small plow without mould-boards, making a shallow furrow,) enlarge the furrow with a shovel-plow, then drag all the weeds, stubble and trash into these furrows, and cover in by throwing two furrows together upon this trench with a two horse plow. Many careless cultivators simply lap two furrows together, leaving six or eight inches of unbroken soil beneath. If good crops are thus raised, and it quite often happens that they are, it is due to the exuberance of a virgin soil, which can make amends for almost any neglect in cultivation. All the writers, and all planters, who have given the results of their experience, agree in saying that cotton requires a

soft, deep bed. The most thorough cultivation would seem to require that the plowing should be continued until all the space between the rows, or the "middles," as they are called, are plowed or "broken out," in cotton parlance, by throwing up the soil upon the beds on each side. But the prevalent custom has been not to "break out" these "middles" at the first plowing, but to do it afterwards in the course of cultivating the crop. On lands that have been thoroughly cultivated, this omission is probably immaterial. At any rate, the very best of crops are produced year after year by this method.

After this first plowing, the ridges or beds should remain a month or so, that the soil may be settled by the spring rains. Planting commences about the first of April, a week or two earlier, say by the fifteenth or twentieth of March, on dry lands, on the lower margin of the cotton belt, and may be delayed as late as the tenth or twentieth of April, in the latitude of Nashville. But any delay after the first of April must abridge that much from the cotton picking season, for four or four and a half months must be allowed for the growth of the cotton plant. Cotton that is well up on the first of April, will, in a favorable season, begin to open early in August, so that by the fifteenth a picker can come out of the rows with fifty pounds a day. Yet if the seed is put in the ground too soon, and a long cold rain follows, it is, like corn, liable to rot, and the plants, when they appear, will have a stunted and yellow look.

The varieties of cotton, and the different kinds of seed, whose respective merits are discussed among planters, are fully treated of in a subsequent chapter.

The two grand divisions of cotton in the United States are into Sea Island and Upland. The seed of the former is black and smooth, of the latter dark yellowish-green, and covered with a fine down. Botanists call the former "tree cotton" and the latter "shrub cotton." The variety of

the shrub cotton most known in this country, is the West Indian, and the seed used on a great majority of the plantations is the Mexican or Petit Gulf.

With a beginner in this branch of agriculture, the variety of Mexican seed which he uses is of much less importance than its age and the condition in which he finds it. Seed that has stood through the winter rains in a great pile near the gin house, as was the practice before the war on most plantations, has been heated by fermentation, and its germinating power destroyed. A very large number of planting enterprizes were dampened by irretrievable delay in the springs of 1865 and 1866 from the difficulty of obtaining good seed. That first planted failed to sprout, was plowed up, and other seed planted in the middle and last of April, and often as late as the middle of May. A month of invaluable time was thus consumed, and to complete the mischief, the second planting was frequently no more fortunate than the first. There is nothing in the nature of the plant that should make seed two or more years old worthless, except the increasing probability that in keeping it for this length of time, it has become heated.

Seed that has been kept a year or two, and well taken care of, will ensure a more vigorous stand of plants as the defective seeds perish in keeping over.

If the beds or ridges have been thrown up for some time, and the surface baked by heavy rains, the soil should be loosened by running a light harrow on the top of the bed. The harrow should have a handle, so that the laborer can walk behind, and keep it on the top of the ridge. A convenient and cheap arrangement for this purpose is made by bending a hickory pole an inch and a half in diameter, and six feet long, in the form of a big ox-bow, and inserting the ends a little behind the middle of each shaft or branch of the common V-shaped harrow.

The harrow is followed by some instrument for making a shallow but very straight furrow for the seeds. Some

planters are so impressed with the importance of having the seed furrow straight, that they send a good hoe hand to draw a line with the edge of his blade. Where the beds are laid off in right lines, as is the case on level and slightly rolling lands, a good instrument can be extemporized by inserting a blunt wooden tooth, three inches long, in a stick, three inches in diameter, at intervals of four feet, if that is the distance of rows determined upon, as represented in Fig. 1.

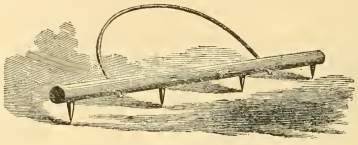

Fig. 1.

Shafts are inserted by which the mule is attached, and a big hickory bow for handling it, as in the harrow. Where the beds are curved, as is the practice in land that washes easily, a contrivance of this sort would be useless, and a light furrow is run with a small plow.

Probably the corn planter in common use at the West might be adjusted so as to work well with cotton seed. The down or beard on the cotton seeds makes them wad together in little clumps or bunches, so they will not fall regularly, one at a time, like the polished and uniform kernels of corn.

Thirty pounds of seed will plant an acre. Less will do it if confidence can be felt in their soundness, and if pains are taken to drop the seeds one at a time, at intervals of from two to five inches. Some of the South Carolina planters use a triangular log, three feet long, armed at the front with a bit of iron, (a small horse-shoe will answer,) which they drag along the middle of the bed, keeping the sharp edge down, so as to make a narrow, smooth trench

for the seeds, and thus ensure a straight line of young plants. Any person of ingenuity can think of some contrivance by which this may be effected, and certainly no part of cotton planting will pay better than attention at this point. Remember that for three months your plows, scrapers, or cultivators, are to be kept running backwards and forwards between these cotton rows, and, if the line of plants is straight and even, the coulter or the outside tooth of the cultivator can be carried so close to the plants as almost to supersede the use of the hoe. Experience has shown that a hand can tend an acre or two acres more, where the planting was done with care and the line of young plants is uniform and even, than where the planting was careless. One great reason why little attention was ever paid to the best and neatest modes of getting a crop into the ground, was the universal feeling that the force of laborers necessary to pick a crop could easily plant and cultivate one. This may be true, but it affords no apology for rude and careless work. If eight plow and hoe hands can raise as much cotton as twelve can pick, it only shows that a skillful planter can keep four hands at making improvements, raising vegetables, and looking after stock during the months of April, May, June, and July, while his less thoughtful neighbor has every hand in the cotton field. Economy of labor always and everywhere pays.

The following is the old established mode of planting, practiced on millions of acres annually. In the warm days of the latter part of March, the seed cotton was hauled to the fields, and dropped in piles of three or four bushels, at convenient distances. A harrow passed along on the top of the bed, followed by a light plow, and behind came a boy or a woman, generally the latter, with an apron full of seed, which was refilled, as often as empty, from the nearest heap. These were dashed by handfuls into the furrow with a quick downward jerk or fling of the right hand, the left meanwhile holding the apron. The seeds

were covered sometimes by a harrow, and sometimes by a board fastened to the lower part of a light plow. This board should be made of some hard wood, as oak or gum, an inch or an inch and a half thick, about eight inches broad, and thirty inches long, beveled on the lower edge, so as to be sharp, and cut away in a curve, so as to fit the ridge. This wooden scraper and coverer, when drawn over the row, covers the seed nicely, leaves a moderate elevation in the middle, and dresses the whole surface of the bed neatly for the space of a foot or more on each side of the drill.

Now what we want is an improved cotton planter, having a few harrow teeth in front, which, with one hand and one or two horses, will go over the beds—a *reliable and even working* arrangement for dropping the seed in drills; and last, the scraper or coverer described above. There is no reason why the whole operation should not be performed by one implement. Ten acres can thus be planted in one day by one team; whereas in the old way it takes a gang of four laborers and three mules to go over the same ground.

In the northern parts of the cotton region, where cold spring rains often delay the planting till the last of April, or the first of May, it is desirable to roll the seed in a fertilizer that will hasten the germination. A compound of two parts of ashes to one of common salt is recommended by Dr. Cloud, a very successful planter in Alabama. Others soak first in salt dissolved in liquid stable manure, and, when damp, roll in plaster. The latter mode is preferable, as the plaster separates the seeds which otherwise tend to mat together, and when the dropping is by hand and carefully done, the white balls are easily to be seen, and can be laid more readily in the bottom of the seed furrow.

Cotton needs only a light covering; not more than peas. An inch is enough, and on damp, clayey soils, too much. It will sometimes happen that a heavy rain, followed by

a hot sun, will fall upon the field just after the planting is concluded. Unless the soil is quite sandy, the surface may bake in a firm crust over the seeds, and delay their sprouting. In this case it is a good plan to pass lightly over the beds with a harrow, taking care to draw up the teeth so as only to scratch the surface and crumble this crust. This is more important in swamp land than on the hills.

CHAPTER III.

HOW THE CROP IS TO BE CULTIVATED

In ten days or two weeks from the time the seed was laid in its narrow bed, the planter, walking over his cotton field, may expect to see a row of tiny leaflets just bursting out of the moist earth. If the interval has been uncommonly wet and cold, anxiety is mingled with his hopes, for so many of the seeds may have rotted as to give him only an uneven and ragged looking stand. The question of replanting must be decided in a day or two, for time is now precious, and every week lost at this end of the season is just so much subtracted from the length of the picking season. If he has planted thick, and the stand, in most places, is a fair one, the chilled seeds in the damper soils may yet come out and do well. He first sees two leaflets, and in about three days the third appears. Cotton has this advantage over many other crops, that it has not the least resemblance to any of the weeds which infest the field, so the most careless glance will decide as to whether a particular sprout is cotton or not. As soon as the third leaf is fairly developed, the cultivation begins, and here, at the very outset, the difference between careful and slovenly planting of the seed will appear. Where the

seeds are dashed carelessly into a wide and somewhat irregular furrow, the line of plants will be correspondingly irregular. If, on the other hand, the furrow or drill was small and sharply defined, and the seeds laid neatly at the drill, and that drill quite straight, the work of thinning out and cutting away to a stand will be very much easier. Of course, the first thing to be done, where the sprouts are very thick, is to cut away the superfluous plants, and concentrate all the fertilizing powers of the soil upon the most thrifty specimens. The usual practice is to "run around the stand," as it is called, that is, to carry a small furrow close up to the crest of the bed on each side, cutting away and covering the grass and superfluous plants. Here very much depends upon the skill of the plowman. By keeping a firm grasp upon the handles, and a close rein on the mule, a good plowman will carry his coulter within two inches of the row of little plants, yet never disturb them, while an inexperienced hand will run a furrow that is sometimes a foot from the row, and sometimes throws a pile of dirt upon the plants and buries them. Where the plowing is well done, the thinning out, or "chopping out," as it is called, can be done rapidly. The hoe-gang pass along, and break up the line of young plants by "chopping out" a gap of, say a foot or more, thus leaving the stand in clumps of three or four together, at intervals of from twelve to twenty or thirty inches according to the exuberance of the soil.

When the plants have sprouted in great uniformity, this operation is almost wholly mechanical, and can be done very fast; but where the stand is irregular, considerable judgment must be constantly exercised in sparing only the most thrifty plants, and such as are most exactly in line. As a rule, it does not pay to be very particular this time over the crop. Let the hoes pass on rapidly, killing the grass that is nearest the plants, and calculating to get over the field in a week, if the weather is fair.

It may be here remarked that rapid movement, and a handling which is brisk, rather than dainty and particular, is the best on most soils. It will not do to linger. While you are bestowing abundant care upon one side of your field, the other side may suffer a set-back from which it will never entirely recover. It is now the first of May, and you have been once over your crop, but there is no time for pausing. While the hoe-gang are in their last rows, let the plows go right back to the side where the planting began, and start in for another working. This time the dirt must be thrown up from the middles toward the plants, yet not so as to choke them or bury the roots too deeply. Let the hoes follow, cutting away all the plants but two, the most thrifty of each clump, and throwing a little soft, fresh earth around those that stand, and destroying all the grass and weeds. This working should be careful, the most so, in fact, of any which the crop receives. Very much, however, depends upon the season. If, just at this time, say from the first to the twentieth of May, there are frequent rains, followed by sultry weather, the grass will grow apace, and the planter must use his discretion as to what part of his farm may be suffering most.

His corn, too, needs attention about this time, but if he must neglect one or the other, experience has shown that corn is much the hardier of the two, at least in a struggle with grass and weeds. Cotton is jealous and exacting in its nature; it must have attention, and dies for want of it; or, if the plant does not die amid the grass, it soon looks yellow and sickly, and suffers a stunting which will abridge its bearing time three weeks or a month.

By the twentieth or twenty-fifth of May, the industrious planter has probably been twice over his crop, and the plants are thinned out to the final or permanent stand. The rest is now comparatively easy. The plows must continue to run until the middles are all broken out; but here

it may be remarked that the cultivation varies with the season, and with the situation of the land. In a summer blessed with the usual rainfall, the plowing goes on, the dirt being thrown up from the middles to the beds. If, however, the rainfall is excessive, so as to form a crust around the roots, it is advisable to carry a light plow near the stand so as to break up this crust, and allow the air and sun to strike upon the roots of the plant.

If, on the other hand, the season is uncommonly dry, it is best to put a larger plow into the middles, and throw up a ridge of dirt that will to some extent protect the roots. But on these points, "doctors disagree," and first-rate planters differ in practice. The opinion is almost universal, however, especially in cultivating the alluvions and the black lands, that the tendency of the plowing should be constantly towards the ridge, and not away from it.

Cotton is a plant that loves heat, and does not demand large supplies of moisture. The climate, or the distribution of rain with sunshine, is a matter which the planter cannot control; he can only take it into account in choosing the region where he would have his farm located. After the plant is six inches high, it is really surprising how little rain will make a crop. An excess of moisture, or heavy rains followed by a fierce sun on flat lands, when the plant is young, is likely to breed lice upon it. This is the first enemy from the insect world that the planter has to meet. A few weeks later, the same state of things will produce rust upon cotton. The diseases and insects destructive of the cotton plant are fully described in a subsequent part of this treatise, and all that need be said here is that brisk working is almost the only remedy in the planter's power. Let him stir the earth actively, and raise the ridge so as to keep standing water away from the roots of the plant.

As to the shape and weight of the plows that are used in cultivating a crop of cotton, there is much variety of

opinion, as well as much room for improvement. The ordinary light wooden plow, with a moulding board of oak faced with iron, of easy draught, and making a furrow two or three inches deep, answers all the purposes of the cotton grower quite well. Planters differ, also, as to the propriety of ever plowing deep, except the first time when the beds are made. Certain it is that very fine crops are habitually made by the use of small, shallow running plows.

After the middles are broken out, it is clear that some form of implement which shall scrape or break up a considerable surface, may be used with advantage. A favorite plow, if such it may be called, among the planters in the Gulf States, is the sweep or Eagle. It is made by fitting flanks or wings to the side of the common scooter or bull

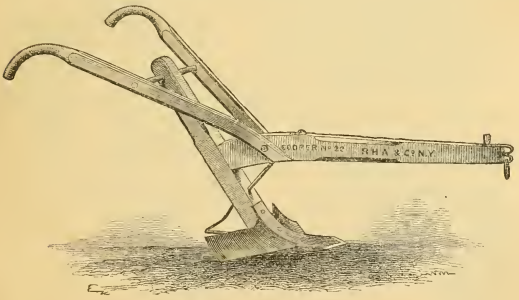

Fig. 2.—COTTON SWEEP.

tongue plow, in such a way as to carry a cutting edge about an inch beneath the surface. It displaces the earth very little, but is an excellent weed-killer, and tends to throw the earth from the middles up to the rows. These wings are made to extend so that in ordinary four-foot rows, once passing over the soil will be sufficient. The cotton sweep represented in Fig. 2, is one of those offered

in the market, and is constructed on much the same principle as here described. Some prefer the ordinary corn-cultivators, and on light lands where it is not important to bed high, they are probably every way as good as the sweep. The principal thing is, that whatever tool you may select should be kept briskly moving. After the second working of the cotton crop, the hoe may to a great extent be dispensed with, but the plow can by no means be laid aside even though the weeds and grass are

Fig. 3.—THE COTTON FLOWER.—(*Sea Island.*)

subdued. During June and the early part of July it is important to press the growth of the plant, and nothing does this so effectively as frequent stirring of the soil.

As a rule, the planter should manage so as to get over

his crop once in two weeks in new, rough, and grassy lands, or when the season is uncommonly wet.

In a favorable season, once in three weeks will suffice. A favorable season for cotton is one in which the principal rainfall comes in early spring, and the summer which follows has few rainy days, but short though frequent showers.

In June and July, especially, a long wet spell is injurious, as also are all sudden and great variations in the amount of moisture. On cotton planted early in April and well tended, the blossoms begin to show in the first days of June. No crop cultivated in this country is so beautiful as cotton. During the month of June the cotton fields present the appearance of vast flower gardens. The blossom is something like that of the hollyhock, and its peculiarity is the change of color that takes place from day to day. A flower will open in the morning of a pale straw color, by noon it will be pure white, in the afternoon of a faint pink, and the next morning a clear pink. Sea Island cotton, however, gives a bloom that is always a pale yellow.

Fig. 4.—THE BOLL NEARLY RIPE.

As the flowers fall off, the "forms," as they are called, or the young bolls, begin to grow rapidly. At first they are somewhat angular in shape, and the enveloping leaf forms a sort of tuft or ruffle at the base. As it swells, the lines grow rounder, though it never becomes

quite spherical. Great changes in the degree of moisture are now very mischievous. A copious rain, followed by hot sun in the latter part of June and in July, will cause the plant to throw out a great number of forms, and the planter's prospects are flattering. But if the heat continues for ten days or two weeks without timely showers, the plant seems to feel that it has undertaken too much, and sheds a great number of its forms. This shedding, however, will be checked by a moderate shower; but a copious rain, followed by drouth, will cause the same phenomenon again. When the plant approaches maturity in size, that is to say, when the branches are beginning to interlock across the middles, it is doubtful whether the plow can be of much benefit. Deep plowing at this stage is clearly injurious. Besides the principal or tap-root of the cotton plant, which runs directly down, it sends off side shoots or sprangles, not so many or so long as those of corn, but enough to be much mangled and broken by a plow, or any other implement, that runs more than two inches below the surface. The breaking of these roots, and putting out of new ones, checks the advance of the crop, and tends to produce a fresh or second growth, the bolls of which will be immature at the coming of frost.

The true policy is to push the growth of cotton just as rapidly as possible until the branches interlock, and then let the vigor of the plant go to making and perfecting bolls.

The old and established routine among the planters of the Gulf States is as described above, and may be condensed into a formula as follows:

First.—In two weeks after planting *bar off*; that is, run a light plow close to the young plants, cutting away the grass, and throwing dirt from the row. The hoes follow and *chop out*, leaving clumps of five or six plants a foot and a half apart.

Second.—Ten days or two weeks after, *mould* or *dirt*

the cotton; that is, let the plows throw the mould up to the row, the hoes to follow thinning the plants to a stand, and leaving everything clean and smooth. The plows keep running till the middles are all broken out.

After this, from the last of May on, the cultivation is mainly with the plow, sweep or cultivator, the hoes going rapidly over and thinning out if the stand appears too thick.

I have known excellent crops raised where this routine was very much modified. For instance, a planter near a great river may be occupied during April and a part of of May in building a levee to keep the water off his fields. It may be the middle of May before he goes over his crop the first time. In that case he had better cut away to a stand the first time over, and at the same time break out his middles. Where the first cultivation is thus thorough, the subsequent workings may be very rapid, and one hoeing make a good clear crop. But this can only be on old land that has been carefully cultivated for many years, till the weeds and grass are well killed out. As a rule, and in four cases out of five, ten days of the moist, hot weather, characteristic of the spring months in the Cotton States, will make a field look "hairy," and the plows must be hastened into it.

As the summer solstice approaches, and during the fierce heat of July and the early part of August, care must be taken for the comfort of both the laborer and his mule. The plowman cannot move to the field too early. At the first gleam of dawn, let him lay the plow-line over his neck, and get his animal between the cotton rows. But he should come in early from the midday heat. Unless the crop is suffering, let him knock off at eleven o'clock, and have a nooning of three or four hours, during which the horse or mule may cool off in the shade, and be in a condition to eat heartily of dry fodder with some corn. If possible, and with ten mules to a hundred acres, it can be

done, the plowman should shift his harness to another animal in the afternoon, and thus keep the condition of his stock well up. A brisk pace before the plow should be insisted upon. As a general thing, the resistance of a small plow or sweep in the light friable soil where cotton flourishes, is not more than fifty pounds, often not more than twenty-five, so that when the rows are straight and even, a good animal can keep up a pace of three miles an hour. So with the hoes. Two rapid though somewhat careless workings are better than one that is slow and thorough; for until the plant is nearly grown, it cannot have the dirt stirred around it too often.

The chief improvement on the old modes of culture that can be made is in the rapidity and evenness of planting, as mentioned in the foregoing chapter, *and in the first working.*

Where the row of young plants is straight at the first working, that is, at the time of the appearance of the third leaf, it requires but little thought to see that some implement could be devised to throw the dirt away, and kill the grass on *each side at the same time.* The Shanghai plow, as it is not very elegantly called, proposes to do this, and some planters who have used it, speak highly of the invention. It consists of two small plows fastened to one beam, one throwing a furrow to the right, the other to the left, and leaving a clear space of about six inches between them. It should be drawn by two horses walking on each side of the row, while the plow moves on the crest, the line of young plants entirely guarded by the open space between the two shares. Some planters have found that the same result may be accomplished by taking out the forward hoes of a common cultivator, and keeping it astride the bed.

We give here a cut and description of one of the Cotton-seed Planters that are before the public, and which promises well, though as yet it has been tested by but

few cotton growers. Those who have used this speak emphatically in its praise. That implement which proves itself best adapted to the work to be done, will of course find favor, and there are several cotton-seed planters which have not yet been fairly tested.

The accompanying cut represents a barrel-shaped revolving seed-box, *C*, with a shaft or axle running through its centre, to which the wheels are attached, and the revolving movement keeps the seed constantly in motion. It is distributed evenly, or properly separated in the row,

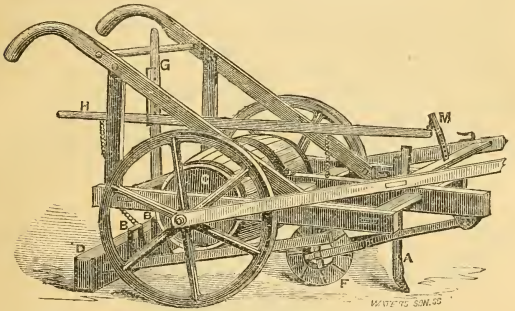

Fig. 5.—INGERSOLL'S REVOLVING COTTON-SEED PLANTER.
Patented June 25th, 1867.

through a series of inner openings and one outer opening on the under side, which is provided with a lever and slide, and the quantity of seed discharged is regulated by moving the slide lever *G*. The distribution of the seed is thus accomplished by a mechanical movement, very simple, effectual, and certain, and no complication of gear-work or springs to get out of order.

The coulter, *A*, is used when necessary to clear away stalks, vines, etc., on the surface.

The furring-wheel, *F*, marks the ground more or less deep where the seed is to fall.

The drag-bar, *D*, has two adjustable covering shares, *B B*, which will run over obstructions without catching, and cover the seed well and evenly.

The lever, *H*, raises both furring-wheel and drag-bar off the ground, when not wanted.

By reversing the form of the seed-box, so that the seed will fall from both ends, a machine is made by which two rows are planted at once. In this case, the horse travels between the rows, the man rides on the machine, the wheels running on the ridges, and the seed is dropped just inside of each, and covered as shown above. By this simple and desirable improvement, one man can plant 15 to 20 acres per day, and it is a matter of great importance that the planting be accomplished as soon as possible after the ground is ready for the seed.

These machines are manufactured in a substantial and durable manner by Ingersoll & Dougherty, Green Point, Kings Co., L. I.

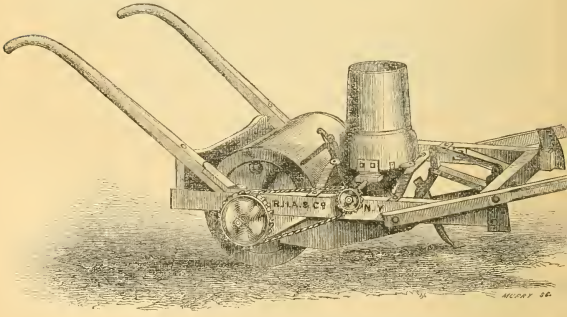

Fig. 6.—FOSTER'S COTTON SEED PLANTER.

Fig. 6 represents Foster's Cotton Seed Planter, as sold by R. H. Allen & Co., of New York. The implement is the invention of Newton Foster, of Palmyra, N. Y., and

was put upon the market in 1860, when a few were sold. Orders now coming from localities where these were sent, in absence of other testimony, indicate that it gives some satisfaction. The seed, as it comes from the gin, is put into the conical hopper and distributed with considerable uniformity, though in rather large quantity, by curved arms revolving on the bottom and pressing the seeds out through openings in the base of the cone, whence they are conducted by a funnel to the drill, which is opened and covered by the machine in its passage.

The *best mode* of planting and cultivating a cotton crop, implements and all considered, may be briefly described as follows; it being understood that the land is capable of producing a bale to the acre with the season favorable.

Break up the whole surface early in March, and bed up for the rows, placing them four or four and a half feet apart. On the first of April, run a small harrow along the top of the bed, follow it by a triangular piece of wood that will make a straight, well defined trench, and drop the seeds, after being soaked in a fertilizing mixture and rolled in ashes and plaster, at intervals of two or three inches; cover with a board that shall leave a smooth, rounded surface.

When the third leaf appears, use a Shanghai plow or some similar implement that will straddle the row, and clean away the grass and weeds on both sides at once. Let the hoes follow, cutting out to a stand, and use sweeps or light plows in breaking out the middles.

Go over the crop once in fifteen days with the plow, and follow with the hoe, if necessary, till the plant is so far grown that the branches begin to interlock across the middles. Then "lay by." Your crop is assured unless damaged or destroyed by the boll worm or the army worm, or killed by a premature frost.

CHAPTER IV.

COTTON PICKING.

Early in August the fortunate and enterprising planter will walk in from a survey of his crop with two or three open bolls in his hand. His harvest is approaching. He plans to have his fodder pulling done in a week, if not already over, and he looks after his sacks and baskets. A yard and a half or two yards of strong Lowell, made into a wide-mouthed sack, and furnished with a broad double strap to go over the neck, is provided for every hand on the place.

The mouth or opening should be made so as to hang open, convenient for the picker. A cord or rope, as big as the little finger, sewed all around the top on the *outside*, helps keep the bag open. The length of the strap and depth of the bag should be carefully adjusted to the size and figure of the laborer, for the planter can ill afford to waste the strength, or needlessly multiply the motions of a picker. Each hand should also have his basket. These are made of wide, white oak splits, coarse in texture, not very heavy, and capable of holding about four bushels. It is very well to have each sack and each basket branded or otherwise marked with the name of the laborer, as it prevents confusion, and it is well known that a workman is always better satisfied to feel that he has absolute and certain control of his tools.

As soon as you can look down between two rows of cotton, and count half a dozen open bolls, start in the pickers. They will get more than it seems likely that they would, and, if active, will probably come out with forty or fifty pounds. From this time on till nearly Christmas the one great business on a cotton plantation, to which everything else must yield, and in which every available finger should be employed, is picking. There is no crop

known, at least in this country, of which the harvesting is so long and monotonous. One boll is just like another, one row the fac simile of its neighbor. There is no science or ingenuity that has been brought, or is likely to be made effectual in very much modifying, abridging or lightening

Fig. 7.—THE COTTON PLANT.

this labor. In the nature of things, it must be done by the fingers, and by the fingers only, in order to be done well. The green seed or Mexican and Petit Gulf cotton, which is the variety chiefly cultivated in this country, when fully mature, opens its burr or shell quite wide, and the mass of cotton within gradually falls outward, and droops by the weight of the seeds. At some periods of the picking sea-

son, for instance during the month of October, these open bolls, with the handful of snowy fibre hanging loose and fleecy, sometimes six or eight inches downward from the stem, present a beautiful and interesting sight.

It seems like very easy work to gather a material which shows itself in such abundance as fairly to whiten the field, but let the skeptic or the grumbler take a bag on his shoulder, and start in between a couple of rows. He will find, upon taking hold of the first boll, that the fibres are quite firmly attached to the interior lining of the pod, and if he makes a quick snatch, thinking to gather the entire lock, he will only tear it in two, or leave considerable adhering to the pod. And yet he may notice that an experienced picker will gather the cotton, and lay his fingers into the middle of the open pod with a certain expertness which only practice gives; the effect of which is to clear the whole pod with one movement of the hand. Even long practice does not enable every laborer to become a rapid picker, no more than every printer is a fast compositor. There is a knack in cotton picking as in type setting, which cannot be acquired by all. Women generally make the fastest pickers, and next to them will be found the small, compact young man, weighing about a hundred and forty pounds, and not more than five feet eight inches in height. Good pickers are generally quiet, sometimes not speaking a word from one end of the row to the other. They are persons who habitually keep their minds directly on the thing in hand, and who, by the constitution of their bodies, enjoy the intensity of swift motions, and naturally love to accomplish a good deal in what they are doing. When the bag attains the weight of, say twenty-five pounds or more, there should be a convenient arrangement for transferring its contents to the basket. It is here that the skill and calculation of a planter are manifested. For instance, if you set your baskets beside one of the plantation roads, and start your hands in to go from there to the other side

of the field and back, they may gather twenty-five pounds in the outward trip. Then coming back to the baskets, they will gather twenty-five more. It is easy to see that the last half of the load will be collected with very much more fatigue and inconvenience than the first half; for, in addition to the labor of picking, the laborer has to carry on his homeward trip twenty-five pounds weight which is continually increasing until it becomes fifty before he is relieved of it. Picking, though not heavy work, is tiresome, and in the last degree monotonous, so that regard for the comfort of the laborer, as well as desire to advance the work, will suggest that the planter make every possible arrangement to relieve and lighten the task, and enable the picker to take his work at the very best advantage.

Let the field be divided up by lanes and roads in such a way that the picker will never carry much weight in his bag. The bags are emptied into the basket as soon as filled, and it is desirable that the hands should keep along together so as to come out about the same time. In fact, it is policy to let the fast pickers work some on the rows of the young and slow pickers. This gives encouragement, keeps the gang of laborers together, and stimulates the slower ones to keep up. Nothing is more disheartening to a young or feeble picker, than to find himself two or three hundred yards in the rear of the main force, tired, with a heavy bag, all the time painfully conscious of his inferiority to the rest, and perhaps too frequently reminded of it by harsh and discouraging words. Though too much talking and singing must interfere with labor, it is earnestly recommended to every cotton grower to take care to secure cheerfulness if not hilarity in the field.

Remember that it is a very severe strain upon the patience and spirits of any one, to be urged to rapid labor of precisely the same description, day after day, week after week, month after month. Humanity, to say nothing of self-interest, (and here humanity and self-interest are iden-

tical,) must suggest various cheap and harmless modes of relieving the tedium of this kind of labor. For instance, let there be refreshments at the baskets, a dish of hot coffee in a cool morning, or a pail of buttermilk in a hot afternoon, or a tub of sweetened water, or a basket of apples, so that when the gang come out from between the rows, and empty their bags, they may for a few moments enjoy themselves, take a little rest, and indulge in a harmless joke before setting in again. They will be certain to more than make up the time by the swiftness with which their fingers will spring from one snowy boll to another, and swiftness of movement is, of all things, what you most need in order to harvest your crop in good time and in good condition. This cannot be expected where the spirits droop, and life is made to seem burdensome. Additional wages should also be paid to the largest pickers. It may be best, in some cases, to change the terms of labor in the picking time, and pay so many cents for every hundred pounds, but as the picking varies greatly, according to the openness of the bolls, this is not so good a plan as to give a bonus of so much for every ten pounds over one hundred or one hundred and fifty or two hundred, which the picker brings in at night. Care should be taken also, to abridge all the labor that is done after the picking ceases at night. The health of your force requires this, for during the principal part of the picking season, the contrast between the temperature of midday and after nightfall is very great, and chill and fever must follow where a person is exposed to both without corresponding change of dress. The practice on a great number of the plantations in the Gulf States, under the old regime, was decidedly faulty in this respect.

The hands were expected to be in the field at early dawn, and commence picking as soon as they could see. In September, and much more so in October, and the following months of autumn, the dews are heavy and cold.

The clothing becomes wet, and the frame chilled in the raw, morning air. But, soon after sunrise, the temperature begins to rise rapidly, and by ten o'clock the thermometer may stand between seventy and eighty degrees. This degree of heat continues for several hours, but declines very fast at sunset, so as to be as low as forty by the time the stars appear. The cotton field will naturally be situated on the lowest lands, and at night the malarious air falls, so as to make them the most unwholesome of any in the vicinity. The effect of exposing laborers daily to such vicissitudes can easily be imagined.

About nine o'clock in the morning, one and another of a gang of laborers would come out of the field, sick with a violent chill. This would be followed by a high fever, and the hand kept from earning anything for three or four days, and often a week.

There is no time in the year when the cotton grower can so ill afford to have his force diminished, as in the picking season. Labor is then everywhere in demand. Good pickers can always command high wages, and everybody that can work is then occupied.

Let the planter remember that an ounce of prevention is worth a pound of cure. Coffee is the most agreeable preventive of miasmatic disease, and quinine the most effective. In picking time, every plantation on low lands should be supplied with both, and should use the former with liberality, and the latter in moderation.

Let the pickers have the sunlight upon them the whole time of their being at work. Kindle a fire at the baskets before they go out, set on a big pot or kettle of coffee, and have it boiling before sunrise. Give each hand a half pint of it, and with it a hard cracker, a roast potato, or a piece of bread. Then, at eight, provide breakfast. Let the work be brisk till nearly sunset, pausing only for dinner, and manage to have the day's picking weighed and stored

away in the gin-house or in cribs, made for the purpose, before the dew falls upon it.

Though such is not the custom, probably, there is no time so favorable for sorting and trashing cotton, as when it is first picked. It is less matted then than at any subsequent handling, and the particles of leaf and stalk and dirt are not entangled in the fibre, as they afterwards become. Instead of weighing the baskets, each hand, as he comes out, can hang his bag upon the hook of a spring balance before he empties it. Then let an invalid, an old person, or a woman, sit by the baskets, and sort over and trash the contents of each bag.

Cotton of the Mexican, Petit Gulf, and Okra varieties, (all of which are "green seed" cottons, differing very little in appearance,) will naturally class into four grades, as it comes from the field.

First.—The fine, long stapled cotton, clean, dry, and silken to the touch. This will greatly predominate in the early pickings, before the frosts and the heavy fall rains occur.

Second.—The short, kinky bolls, that have been bored by the boll worm, and not quite killed, or which came late, and were unclenched by the frost, or which grew under the disadvantage of excessive or irregular moisture.

Third.—Trashy cotton. This abounds after the heavy frosts, and the trash consists of minute fragments of leaves and stems, that become hopelessly mixed with the fibres, so as never to be entirely removed. They cause the small black specks that abound in the coarser varieties of Lowells and Osnaburgs.

Fourth.—Dirty cotton. This comes in after heavy rains, accompanied by winds, which have blown out the contents of the pods, and beaten it into the earth, or driven sand all through the fibres.

During the months of September and October, there is no need of having much trashy or dirty cotton. That which

is kinky or imperfectly developed, should be carefully separated from the best, and either kept by itself or thrown with the other low grades. The manufacturer can use it in making strong, coarse fabrics.

The cotton of long staple and high grade, should not be allowed to become damp with dew, but taken while still warm and dry, and stored in a shed or in the gin-house, and lie a month or two before it is ginned. This gives the oil in the seeds time to ascend into the fibres, thus imparting a fine, pale, straw color, which the manufacturer loves to see, and also increasing the weight.

It is almost impossible, after the heavy frosts, to pick cotton free of trash, and where the crop is large, more than half of it may come under this description. In some conditions of the market, planters find the difference between trashy and clean cotton so little, as to discourage them from efforts to send a fine article to market. But, in general, moderate painstaking will enable the grower to command from two to five cents more per pound.

The thoughtful planter will also manage so as to have the cotton handled as few times as possible, both to economize labor, finish work as early as possible, and prevent his staple from becoming matted and dirty. Where ten baskets are to be emptied twice a day, there is no need of pouring them into a great box wagon, stamping down, and then unloading, by filling the basket again at the crib or gin-house. When the work is in a remote field, and the weighing is done by torchlight, the hands about the wagons may not get their suppers till eight or nine o'clock.

Where the roads are good, an excellent plan is to couple the fore and hind wheels of a wagon with a pole of proper length, lay two other poles or long planks on the axle-trees, set the basket on them, and empty at the gin-house. If the weighing is done in a bag, this is entirely practicable, and allows all the hands to get to their houses in half an hour after they came out from the rows. Where the num-

ber of baskets is large, some other plan can easily be devised by one who is studying how to get the greatest amount of work done in the shortest time, and with the least wear of muscle.

The month of October is the height of the picking season in the best cotton regions. Many fields that were rapidly picked early in September, are now literally "white for the harvest." Now the planter cannot urge his work too zealously. But let him not, in his pushing, encroach upon the hours of relaxation and sleep. His rule should be: "Gather no cotton upon which the sun is not shining, and to pay high for fast picking rather than for night work."

At times, in the picking season, it will be advisable to divide the force, especially where it is large, into "fast pickers" and "the trash gang," instructing the former to press along, and gather rapidly all the fair clean cotton that is hanging open on the upper branches of the bush, the others to follow, gleaning all that remains, the imperfect bolls, that which has fallen to the ground, or been trailed in the dirt.

The picking season lasts from three to four months, including all of September, October, and November, and frequently a part of August and December. But where cotton opens early, there is no reason why it should not be nearly all gathered by the tenth of December.

In the older regions of the South, as Georgia and South Carolina, it has been the usual practice to weigh but once a day, and to require a hundred and fifty pounds as a day's work. In good open cotton, a fast hand will gather this amount in five or six hours, but in the beginning, as at the close of the season, the whole day will be consumed in picking this number of pounds.

It requires rather more than three times the weight of lint to make a given amount of unginned cotton. Thus, from fifteen to eighteen hundred pounds of cotton in the

seed will be required in making a bale of the usual weight. Ten good hands can pick a bale per day. Hence, if ten hands have planted a hundred acres, which proves a good crop, they will consume a hundred days in picking it out.

CHAPTER V.

GINNING, BALING AND MARKETING.

In detailing, step by step, the process of cotton raising, we have hitherto been dealing, as it were, with fixed quantities. The directions given for the stock and implements of a cotton farm, the preparation of the soil, the selection of seed, the planting and cultivation, and, as in the last chapter, the picking and storing of cotton in the seed, apply with hardly any variations to the production of the crop wherever it is extensively raised in the United States. No material changes can be made in this routine, whether you have selected a warm and sunny slope in southern Illinois, or drop your seed into the rank and teeming soil of Louisiana, in fields bordered by rows of orange trees.

We speak now not so much of what *must* be done, as of what *may* be done. The producer now has in his sheds, or, perhaps, in cribs in the field, a large amount of cotton in the seed. When the picking season comes to an end, toward the middle of December, he may have a hundred and forty thousand pounds; that is on the supposition that his ten hands have been successful in the cultivation of a hundred acres. Every thrifty planter, however, must be supposed to have anticipated the marketing of his crop, and to have made, at least, some preparation in the earlier part of the season for ginning and baling.

If there was no gin on the place, it is fair to suppose that he bought one in August, while the crop was in the

interval between cultivation and harvest, and made arrangements, more or less complete, for the easy and rapid handling of his crop when picked. These arrangements may be of various degrees of rudeness, from a simple open shed, sufficient only to shelter his machinery, or a big-walled tent, to a large, complete, and perfectly appointed gin-house, costing three or four thousand dollars.

As a general thing, horse-power is employed in ginning American cotton. On very large plantations, where the amount raised approximates to a thousand bales, a steam gin is in most cases erected. These are matters that depend almost entirely upon the amount of capital that one brings to the business, the permanence with which the planter expects to be engaged in cotton-raising, and the depth and richness of the land he is cultivating.

The principle of the cotton-gin is simple, and its mechanism is not complicated. The ingenuity and patience displayed by Eli Whitney in inventing and perfecting this machine, and the wonderful effect it has had in the social and political economy of the world, are spoken of more fully in the closing chapter of this treatise. But at this point in cotton producing, every good planter must become, to some extent, a mechanic; for no person can successfully operate with a machine like the cotton-gin, who does not quite thoroughly understand the precise mode in which it operates, when it does the work well, and when imperfectly, and how its different parts are to be adjusted so as to perform their office in the best manner.

Take a wooden cylinder, say four feet long, and five inches in diameter. Fasten upon it a series of small circular saws, say nine inches in diameter, so that the edge will rise two inches above the cylinder all around. Let there be eighty of these saws; they will be set upon the cylinder a fraction over half an inch apart. The teeth of these saws are filed, so as turn from you as you stand before the cylinder. Now place your cylinder, thus armed

with its thousands of little saw teeth, upon bearings, and let it revolve, bringing a considerable mass of cotton in the seed to press against these teeth. It is easy to see that, if the cylinder revolves rapidly, the teeth must very soon pull off the lint from the seeds to which it is attached. These teeth play between steel bars, which allow the lint, but not the seed to pass.

Now below the saws fit a set of stiff brushes upon another cylinder, and let them revolve in the opposite direction. Their effect will be to brush off and clear away from the saw-teeth of the cylinder the lint which they have just pulled from the seed. You need now a fan, revolving so as to make a blast of air, in order to throw the light and downy lint, which has thus been liberated, to a convenient distance from the revolving saws and brushes.

These three are the essential parts of the Whitney cotton-gin. All the rest is cabinet work. A number of improvements have, of late years, been made in this machine, the effect of which is to pick the cotton more perfectly from the seed, to prevent the teeth from cutting the staple, and to give greater regularity to its operations. But when you have purchased a gin, the principal consideration will be, how to place it in such a way that the cotton may be brought to it with the least labor, and how the lint may be taken to the screw, or other arrangement for pressing, with the greatest convenience.

The power for driving the gin is produced by two or more horses acting on an upright, which revolves on an iron pivot. Horizontal arms extend, say, ten feet. There are, usually, four of these arms, to which the horses are attached. At the upper end of this vertical revolving shaft, is a large cog-wheel, say twenty feet in diameter, the teeth of which play into a ratchet wheel, to the axle of which a large drum is attached. This gearing gives sufficient rapidity of motion to the drum, from which a band passes directly to the gin.

A and *B* represent respectively the first and second stories of a gin-house. *V S* (Fig. 8) is a vertical shaft, with horizontal arms, to which horses are attached at *h* and *h*, which pull around in the dotted path. At the south end of the building, *S* represents an iron screw working in a strong frame, and driven upward by a mule, *m*, towards *P*, the packing-box, which opens in the second story.

G, in this story, (Fig. 9,) is the gin, which discharges ginned cotton into *L* the lint room, where it is picked up by the

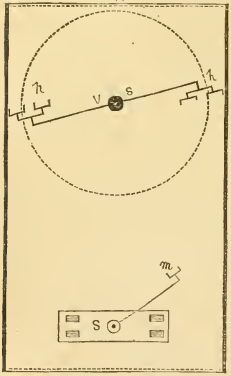

Fig. 8

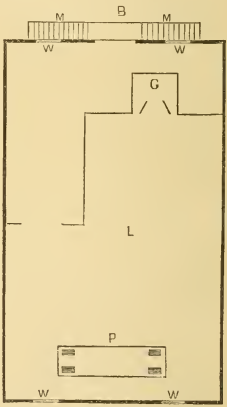

Fig. 9.

armful, and thrown into the packing-box; *W*, *W*, *W*, *W*, are windows, so placed as to throw strong light on *G*, the gin, and *P*, the press; the short lines, *M*, *M*, represent a double open staircase, up which the seed-cotton is carried on the shoulders of the laborers. They go up one flight, and down the other, so as not to interfere with each other.

In the latter part of the picking season, after the fall rains set in, much of the cotton which comes from the

field will be damp, not to say wet, and much of that which was picked dry, and has been stored in cribs or sheds, will be too damp for the gin.

The rule is that no cotton is fit to gin unless the seed snaps brittle between the teeth. Hence a necessary accompaniment of every gin is a scaffolding, more or less extensive, upon which the cotton may be sunned. In most cases, this scaffolding consists of boards rudely supported on blocks or stakes driven in the earth, and, where the amount of cotton to be sunned is not large, a permanent and more expensive arrangement would hardly pay. But on the lower bottoms of the Cotton States, what with the heavy dews, frequent rains, and late picking, there is always a great deal of cotton on the scaffold. Hence it becomes important that it should be so arranged as to afford the utmost convenience in handling; for every laborer unnecessarily kept around the gin-house, is so much subtracted from the picking force. There is no reason why two hands, with a boy to drive the mules, should not conduct all parts of the ginning process, but the practice has been to have three, four, and sometimes five hands, more or less, busy about a gin-house.

The side view, presented on the next page, will give a tolerably clear conception of a very convenient arrangement for drying cotton.

The gin-house is presumed to stand north and south, giving at its southern end a sunny exposure, where the scaffold, S, is erected. It will be seen that this scaffold extends from the left, or third story, in a gradual slope to within six feet of the ground. It is supported by posts, which should be charred at the lower end to prevent decay. At the end next the building, it is high enough to enable a loaded wagon to drive under, and discharge cotton that is perfectly dry into either story of the gin-house. The slope of the scaffold should be so gentle as to admit of easy walking upon it, and should be roofed with some

material as tin that has been sanded, or felt roofing covered with gravel, so as not to become slippery, which would be the case with shingles or boards. The shelter beneath this scaffolding affords ample and convenient room for storing a hundred bales of cotton.

When a load of cotton comes in from the field wet or damp, it can be driven close alongside of this scaffold, and rapidly unloaded. If the day is clear, a few hours of sun will fit it for the gin, and the labor of putting it into baskets, and carrying up the gentle slope into the loft of the

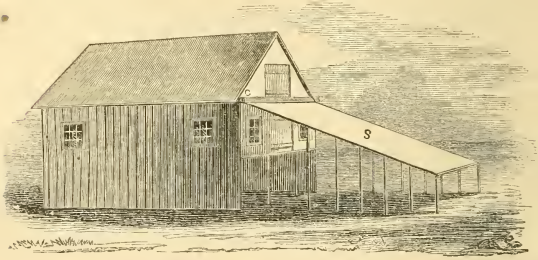

Fig. 10.—GIN-HOUSE WITH SCAFFOLD.

gin-house is very moderate. *C C* represents a broad sheet of painted canvass, which is rolled around a pole after the manner of a street awning. In clear weather this canvass is kept snugly rolled at the upper end of the scaffolding, just under the threshold of the loft door. In case of a sudden shower, instead of calling hands from the field to hurry the cotton under shelter, two hands can take hold of the opposite ends of the canvass pole, and in two minutes have everything on the scaffold securely protected from wet. An arrangement of this sort is evidently a great labor saver, and is almost equal to the addition of another hand to the picking force.

These arrangements for ginning and baling cotton are

described, not as being in the nature of things the best that might be devised, but as those in common use throughout the South.

None of the presses on the plantations are as effective as they might be, and the result is that all of the crop that is packed into the holds of ships at Charleston, Mobile, New Orleans, and Galveston, three-fourths or four-fifths of all the staple grown has to be pressed and bound over again. The average expense of receiving, storing, pressing, and binding over, hauling down to the wharves and delivering to the vessels, of a cotton crop, is two dollars per bale, and almost the whole of this is unnecessary. The number of bales received and shipped at New Orleans in 1860 was, in round numbers, a million. This million of bales paid to draymen, shipping clerks, cotton-press men and the owners of cotton sheds, and commission merchants, two millions of dollars, all of which came out of the planters, and the greater part of which could have been avoided by sending the cotton to market in compact, square bales, thoroughly pressed, and well bound. Suppose, for instance, a cotton grower, in some part of the Mississippi Valley, produces annually five hundred bales, which he sends to market in the usual way. At a moderate calculation he pays a dollar and a half a bale in New Orleans, for having his cotton pressed over and for the hauling, storing, and waste incident to that operation. Thus his defective packing costs him seven hundred and fifty dollars a year. Now, five hundred dollars would erect for him a strong press, operating on the hydraulic principle, in which he could make as small a bale as can be made in the powerful steam presses of New Orleans. But he need not resort to a hydraulic press. The patentees of several of the improved hay and cotton-presses in use throughout the Northern States, will agree for one hundred dollars more than the cost of the common iron or wooden screw arrangement, to put him up a press, simple in principle

and easy in its operation, that will put four hundred pounds of cotton into forty cubic feet, which is about the degree of compression given by the steam press. There is another important advantage to be gained by putting the cotton into small compact bales. Its freight will cost a third or a half less, whether by car or steamboat, it will waste less in handling, and, if bound with iron hoops, will be in far less danger of destruction by fire.

Of late the iron hoop or tie has rapidly superseded the rope in former use, and it has the recommendation of being cheaper as well as every way better.

It makes a neat, firm looking bale, not liable to burst from the untying or cutting of the ropes, and, as a grand advantage, the iron hoops hold the cotton so compactly that in case of a fire only the surface is scorched.

In general, the hoop used among planters is too narrow, being less than an inch. If the cotton growers would use better presses, so as to force the usual number of pounds into a third or half less space than a four hundred-pound bale usually occupies, and then confine it with eight to ten hoops an inch or an inch and a quarter wide, the package would leave the gin-house in a condition to make the trip to Manchester or Lowell without damage from fire, water, or rough and frequent handling.

Since the effect of the recent war in opening the South to free labor, and the application of Yankee ingenuity in overcoming the various problems and difficulties in cotton-growing, several cotton presses, new in their design and admirable in their principle, have been submitted to the cotton growing community.

Among these one of the best is that patented in 1860, by P. G. Gardner. The cut of this admirable press which faces this page, needs but little explanation. The effect of turning the large cast iron wheels on each side of the press, is to move the screws *c* and *d* with great force in the direction desired. These screws are fastened to *a* and *b*, cast iron

shafts, which move on the track laid for them by the wheels at their ends.

At their upper ends, these shafts are connected by a toggle-joint, above which is the follower, which moves up and down in the packing-box. This cut represents the

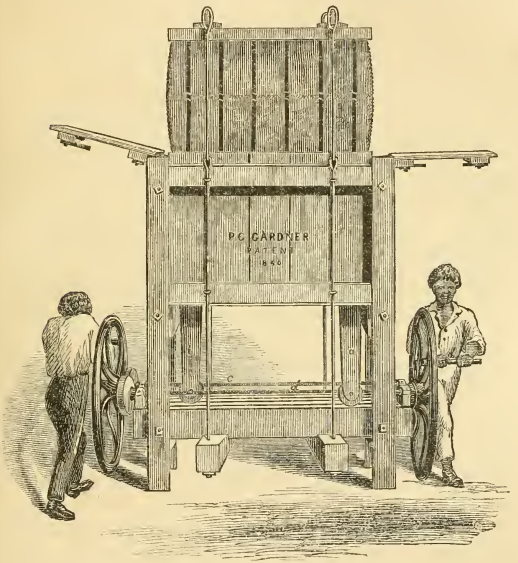

Fig. 11.—P. G. GARDNER'S COTTON PRESS.

position of the machinery when the bale is compressed, that is, when the toggle-joint and the follower are at the top of the packing-box. By turning the wheels in the opposite direction from which they were turned to carry the follower up, *a* will be brought over to the left

side of the press, and *b* to the right side. This will lower the follower to the bottom of the packing-box, when it may be filled with a new charge from the lint room, beneath which it should be set up.

It will be seen at once by those at all familiar with the mechanical principles, that a combination of the toggle or elbow-joint with the screw and lever, gives immense power to this press. And the power is applied in just the way to have the greatest effect upon a material so elastic as cotton. It is the last foot or two feet of the compression that demands power. The old wooden or iron screw will make a bale from three to four feet thick without much difficulty. But this press will take an ordinary bale, and compress it to a thickness of two feet, for it is the peculiarity of the toggle-joint piece, that its power becomes enormous when the two shafts that compose it approach a perpendicular or straight line.

The size of a bale, when pressed by this machine, is five and a half feet long, two wide, and about three feet high. Within this space, which is almost exactly a cubic yard, or twenty-seven solid feet, five hundred pounds can be compressed by two stout men working for five minutes on the wheels. Now, the average dimensions of the New Orleans bale, which contains four hundred and fifty pounds, is thirty-two cubic feet. That is; after the action of the immense steam compress, the ordinary New Orleans bale of commerce is five solid feet larger and fifty pounds lighter, than the package which two hands can produce at the plantation with this improved and powerful press.

The cut (Fig. 12) represents a Plantation Cotton Press, which is worked exclusively by hand-power, with the bale packed, sacked, and tied, and ready to be turned out. It is made by Messrs. Ingersoll & Dougherty, Green Point, Kings Co., N. Y. Other presses, to be worked by horse-power, are made by the same parties, under patents issued April 15, 1856; June 16, 1863; July 28, 1863; and Janu-

ary 24, 1865. The manufacture of this press was commenced in the spring of 1856. Since that time over 3000 of them have been put in use, and the very excellent reputation which they have gained, as cheap, portable, and

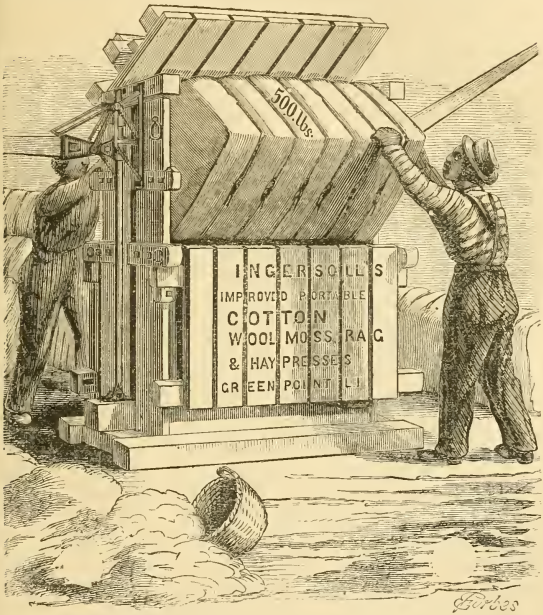

Fig. 12.—INGERSOLL'S COTTON PRESS.

convenient presses, induces us to present it here as one of the necessary, useful, and labor-saving machines, required by the planter in preparing his crop for transportation and a market.

Two hands only are required to work it, and will put

up, in good shape and well packed, twenty or more bales per day.

The press is made of any size or weight of bale required, and when taken apart, it comprises 6 to 7 packages convenient for handling and shipping, and hence is well adapted to shipping to Central and South America, and other foreign countries, where they are often taken on the backs of mules to the interior of the country, and the cotton packed and brought back to the coast in bales of about 125 to 200 lbs. each.

The No. 1 Press makes a bale of 300 lbs., or under, and its gross weight is 800 to 1100 lbs. This size is mostly made for foreign shipment.

No. 2.—Weight of bale 400 lbs.; gross weight of Press 1600 lbs.

No. 3.—Weight of bale 500 lbs.; weight of Press 1900 lbs. Its portable form admits of its being set alongside of the gin and close to the cotton, or on any floor of the building.

When the irons get worn out or broken, duplicates can be sent by Express to any part of the country, at little expense. Catalogues with price-lists, etc., can be obtained by addressing the manufacturers.

The cut (Fig. 13) represents Ingersoll's Bale Rope Tightener, patented June 25th, 1867. The same parties also manufacture the Iron Hoop and Wire Tightener. These are cheap and very convenient tools for drawing rope, hoop, or wire tight on cotton or hay bales. The cut shows the application of the Bale Rope Tightener. Every person baling cotton will find this a desirable tool. Fig. 2 shows the point of the lever, with the clamps and the mode of putting the rope through them.

The well-informed and successful cotton grower is more than a mere routine agriculturalist. As he needs some knowledge of mechanics, and facility in planning convenient arrangements about his gin-house, so in securing the best

price for his great staple, he requires to know something of the great laws of supply and demand in cotton, so as to form a correct and intelligent judgment as to whether he shall sell or hold.

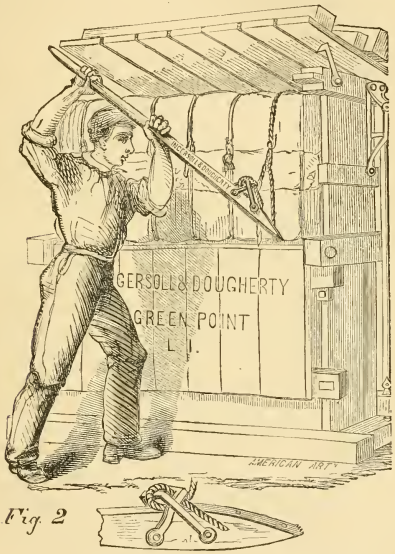

Fig. 13.—INGERSOLL'S BALE ROPE TIGHTENER.

It is of great importance that he establish with the merchant and the broker a high reputation for honor and correctness in packing his staple, and preparing it for market.

When George Washington was largely engaged in tobacco growing, he shipped directly from the Potomac to London. There the tobacco inspectors opened each hogshead to examine and pronounce upon its quality. After

opening a great many of Washington's hogsheads, they were satisfied that he never sent anything but "prime;" so at length they gave over examining tobacco that came with the brand "G. W."

This should be the ambition of every producer of a great staple. His brand should be a pledge of high quality and entire reliability as to the manner in which it is packed. The planter should also graduate his expenses, and manage his account current with his factor, in such a way as to be able to take advantage of the market, and sell when he chooses, not as soon as he can. He should keep posted as to the cotton supply in England and elsewhere, and be able to give his merchant sound instructions as to what to do with his shipments.

The machinery by which the producer of cotton communicates with the spinner and weaver should be as simple as possible.

Probably three-fourths of the crop is taken to market on steamboats, which land often within a hundred yards of the planter's door.

They then go down to the exporting cities, as Mobile, New Orleans, Savannah, Galveston, and often pass directly by the ships that have come from New York, Boston, Liverpool, Havre, Antwerp, and St. Petersburg, and are waiting to take in a cargo of cotton. Now, in the nature of things, what reason is there why the steamboat should not run alongside the ship, and discharge her cargo directly into the hold of the sea-going vessel, a gang of stevedores being at hand to stow it away, the agent of the foreign purchaser being on board the ship, and sending back to the planter an account of sale and bill of lading, with a sight or a sixty or ninety day draft for the price? How much delay, commission, waste, brokerage, vexation and loss might be avoided by a transaction so direct!

In that case, and at present prices, (December, 1866,) the hundred bale cotton grower, whom we have been fol-

lowing in his routine of plowing, planting, cultivating, picking, ginning, and pressing a crop, might, early in the year following, put his cotton in a Liverpool bottom, and receive his payment in a check on the Bank of England for twelve thousand dollars in British gold.

CHAPTER VI.

THE COTTON PLANTER'S CALENDAR.

What follows is in the nature of a summary and recapitulation of much that has been set forth in detail, in the foregoing five chapters. It is calculated for about the middle of the cotton belt, or the lands where cotton is produced, between the thirty-second and the thirty-fourth degree of north latitude. Some other crops, such as corn, peas, and oats are alluded to, as they are cultivated more or less on every plantation.

JANUARY.

The gin is to be kept running most of the time during this month on last year's crop. It is best to have a convenient scaffold arranged on the south side of your gin, of an easy slope, and passing directly to the gin loft, so that cotton can be taken from the sheds or cribs, dried, and carried up to where it will feed itself into the gin, or can be pulled in by the operator before the stand.

Read the papers, keep informed as to rise or decline in the cotton market, the supply and demand.

Have a powerful press, sufficient to put four hundred pounds into the space of forty cubic feet. Use wide iron hoops, and plenty of them. Look well after the ends of your bales, and see that they are perfectly snug.

On pleasant days, the hands may be breaking down the cotton stalks, or clearing new land.

This is a good time also to fill up washes and old gulches in the field, and prevent little ones from growing any larger. Cut down pine bushes, and lay them in the washes lengthwise; cane from the cane-brakes answers the same purpose very well. Take care of your cotton seed at this time. That which is intended for planting, should be stored in a shed or loft, where the air has free access, and stirred to prevent fermentation. The rest should be carefully saved for manure. The ashes of it were found, by one analysis, to contain fifty-five per cent of potash, and if it is faithfully returned to the cotton field, and your lands prevented from washing, cotton will be found a very slow exhauster of the soil.

FEBRUARY

You must expect numerous and heavy rains this month, but on porous soils, after the twelfth or fifteenth, it will be dry enough to plow.

This is the proper time for projecting the crop of another year, obtaining hands, fixing them in comfortable quarters, and purchasing additional mules and other stock.

Cut and haul a supply of wood. Haul out your cotton seed and other manures, and spread them on the fields. Decide as to rotation of crops; where you will have your cotton, where your corn, oats, and sweet potatoes.

After the middle of the month, whenever it is dry enough, let the two-horse plows be throwing up beds for the cotton rows. Four feet apart on hill lands, and five or five and a half in the swamp, is the rule.

Cotton that stands thick, will produce as many open bolls before frost as that which is thinner, and it is the open bolls before frost that will give you the best cotton.

Get in a few acres of oats.

MARCH.

The first plowing continued briskly. Corn lands plowed thoroughly, and oats sowed. Have a large kitchen garden, raise plenty of cabbages, sugar beets, carrots, parsnips, onions, okra, and melons.

A cotton soil and climate are exactly suited to melons, and it will pay to put an acre in watermelons and cantelopes.

This is a proper time for working plantation roads, filling up the washes, and laying off circle ditches on hill lands. By circle ditching and circle plowing, you can cultivate a soil, that is as mellow as an ash heap, on a side hill, and yet keep it from washing away.

Observation will teach you what fall a ditch may have, and not wash. It is different in different soils. A fall of an inch in ten feet is the rule that some follow.

If the season is early and dry, you can plant in the last of March. It is desirable to get your corn planting out of the way before you commence on cotton.

APRIL.

A busy month this for the cotton planter. He must make every edge cut, particularly if he has grassy fields. The first of the month will be taken up with cotton planting. You cannot be too thorough or particular in getting in your seed. Aim to have mellow beds, and straight, even rows. Run a fine-toothed harrow over the tops of your beds, and fasten on the cross-piece, so as to project behind the middle of the harrow, a triangular piece of wood, with the edge down, so as to make a clean, even trench for your seed, which should be soaked in a fertilizing mixture a day or two, and rolled, while damp, in ashes and plaster.

Drop your seeds at intervals of an inch or two in the bottom of the little trench, and cover with a board attached to a light plow, notched so as to fit the curve of the bed.

As soon as your cotton is planted, go over your corn for the first time, and turn immediately back to the cotton field to give it the first working.

Try the Shanghai plow for the first working. Some planters speak very highly of it. You may, perhaps, do almost as well by taking out the three forward hoes of your cultivator, and passing it along above the young plants and astride of the row.

Let the hoes follow the plows, cutting away two breadths of a common hoe, thus leaving a clump of plants at intervals of about a foot and a half. In some cases, where your plants are vigorous, and the season pushes, it may do very well to cut away to a stand at once, or, at least, so as to leave but two thrifty plants in a place. At all events, keep down the grass. If you have to go over your crop once in a week, get the grass under now, and it will not give you much trouble during the rest of the season.

MAY.

Another crowding month on a cotton farm. Both crops, your corn and your cotton, demand attention, and neglect now can never be made up.

During the first half of May you will give the cotton its most thorough working. Let the plows keep a brisk pace if they have much ground to go over. They should go around the first time moulding the rows, and be followed close by the hoes, to uncover the plants that have been buried by the plow running too near. Then the middles should be broken out, and the crop left perfectly clean, cut out to a permanent stand, and the ground all stirred.

After running two furrows to each row, so the hoes can go over the crop, it may be advisable to put the plows into the corn field, and let them go through that before breaking out the middles of the cotton. Some time must be found also for the potato patch. Work them clean and

hill up thoroughly. The vines will soon monopolize the surface, and exclude the weeds and grass.

Towards the last of the month, get the plows back into the cotton. The sweep is probably the best implement to put into the field now. Any blacksmith can convert a common bull-tongue or a scooter plow into a sweep or eagle, by putting a wing to the lower part of the coulter, two or three inches from the point. A good plowman can carry his sweep within two inches of the line of plants without killing any. This greatly abridges the labor of the hoe hands.

JUNE.

In this month the cultivation of cotton must vary somewhat with the season and the soil.

If you are planting on rolling or hilly land, and the season is dry, throw up a considerable furrow from the middle to the roots of the plant. On bottom land this is unnecessary, for cotton on alluvial soil seldom suffers much from drouth. On the other hand, on flat lands, if the season is wet, you will have to throw up a ridge to prevent water from settling around the roots.

The plows continue to run actively all this month, both in corn and cotton. It is well to accustom the mules and horses to a rapid walk between the rows. Use an animal but half of these long hot days. Commence early, and give a long nooning. Hold each plowman responsible for the condition of his mule, and allow a bonus or extra wages to the one that brings his animal out of the crop in the best condition.

Look well after the comfort of man and beast these blazing days, when the thermometer stands at 120° in the field. Give the hands plenty of drink, but let it be acidulated, such as vinegar and water, or buttermilk, somewhat diluted.

JULY.

You will go over your corn for the last time this month, if the season is dry. A stirring of the soil between the rows will help it to resist the effect of the intense heat, and prevent the lower leaves from "firing." Cotton needs another plowing, but if the previous cultivation has been thorough, the crop can be laid by the last of this month.

As soon as your corn is "past roasting ear," pull fodder. As this work is by no means easy, and comes in the height of midsummer heat, some of the hands are quite likely to injure themselves unless special care is exercised.

Drenched as they are with perspiration, they must drink frequently, and the water should never be cold. If vinegar and a little sugar is added, all the better. There is no use in pushing laborers now. A press of work is soon to come, and you do not want to start a set of jaded and half-sick hands to picking.

Some have doubted the propriety of stripping the leaves from Indian corn before the ears are mature. You lose a little in the weight of shelled corn and in its fattening properties, but for the southern climate a more wholesome corn is produced in this way, than by allowing the whole plant to stand till dead ripe. It will not be so heating to animals, and the bread made from it is lighter and more palatable.

AUGUST.

The picking season is at hand. Store your dry fodder, and get ready to send every hand into the cotton field.

About the middle of the month you will observe quite a number of the lower or ground bolls open. As soon as a picker can gather fifty pounds, the work of harvesting begins. It will continue three and a half or four months.

This is the time of year to be on the watch against your

two enemies, the cotton worm and the army worm. If they make an attack in force, your crop will be swept away almost as soon as Jonah's gourd. The army worm is much less insidious in its advance than the cotton moth or cotton caterpillar, and you can arrest the march of the devouring army by a narrow, sharp cut ditch carried all around the place. If you hear of the advancing host from the south or south-west, lose no time in starting your double plows in on the side of your field which is threatened. Throw a furrow from the crop, and let the hoe and spade follow, clearing out and cutting down till you have a perpendicular wall of earth, from twelve to eighteen inches high, facing the enemy. Feeble as this earthwork appears to be, it is enough to stop the march. As soon as the advance guard reaches your lands, however, a strict watch must be kept, lest at some point they find a low place in the earthen wall or some means of scaling it. It may be well to keep the double plows at hand, in order to deepen and clear out the ditch as they come piling into it.

The caterpillar, cotton worm or cotton moth, for each of these names is applied to the same animal, appears also in August. You will see a few pale brown millers or moths flitting over the cotton field. By watching, you may observe the insect selecting a leaf for her web or nest. She will generally discover the place of her eggs by cutting the midriff or largest fibre of the leaf, and bending it over so as to form a little shelter tent, so to speak, for her young. The eggs hatch in ten days, and the little worms begin at once to devour the plant upon which they were born. They eat constantly, day and night, growing rapidly to the length of about an inch and a quarter. The time for fighting this enemy is as soon as you see the first moth. They are clumsy and slow in their flight, so they can be struck down with little paddles and killed. As some will, of course, escape this attack, the planter should

look carefully through the rows of his crop for the leaves on which the eggs have been laid.

With a little practice, the eye becomes quick at detecting the leaves that have been cut and bent over. These should be carefully gleaned, put into the cotton bags, and burned.

Some have succeeded in protecting a crop by catching the moths in plates, half filled with a mixture of molasses, vinegar, and cobalt, and exposed at numerous points over the field.

Every preventive and each mode of attacking the enemy should be employed. Some have destroyed a great number of these pests by building small fires in different parts of the field, into which they plunge and perish. Others plant white flags about the field, upon which it is thought the fly deposits its eggs.

SEPTEMBER.

If your crop was rescued from the devourers, nothing now remains but to press the picking as actively as possible. The best cotton is gathered in September and October. Provide every facility for your hands, good bags with open mouths, baskets, and a scale or balance that weighs rapidly. Give hot coffee in the morning, especially if you are on low land, encourage fast picking by corresponding wages, and manage to keep them out of the night air. You can ill afford to have hands out of the field now with chill and fever.

OCTOBER.

The best month for picking. It is a remarkable set of hands that can average two hundred pounds all around, yet, among a force of twenty pickers, some will always bring in more than that in open cotton.

Keep the morale of your laborers at a high point. A sad heart makes the motions slow. Hands will not pick any the worse the next day for having danced till ten or eleven o'clock the night before; and, among Africans at least, the best dancer is likely to be the best picker.

Unless your crop is very large, so as to need every finger in your employ to pick it out, the best time for sorting the cotton is when it is first picked. Before November you will not have much inferior cotton. After frost and heavy rains there will be many imperfect bolls that yield a crumpled or kinky staple, and much cotton will be beaten out of the pods by driving rains, and made muddy by earth dashed upon it, or sand driven into it. This can be cleaned so as to be but little inferior to choice cotton, but the two should not be mixed, as the trashy will lower the price of the clean with which the buyer finds it mixed.

Many cotton growers have a "trasher," a simple machine, driven by a band from the drum, which cleans the staple by whipping it against a series of pegs or teeth.

Trashy and dirty cotton ought to be dried and trashed before being stored away for ginning.

NOVEMBER.

As the season grows cool, the picking at night and morning is anything but pleasant.

Nothing will be gained in the end by gathering in a cold and heavy dew. Let there be fires kindled at the baskets, and in every manner seek the comfort of the hands, for the staple which they are picking now is somewhat inferior, and their encouragement is that the long pull of monotonous and wearisome labor is nearly over. If the market is favorable, ginning is begun this month, and often much earlier. A good eighty saw gin will pick off less than a bale an hour, say eight bales in ten or twelve hours. But this rapid ginning generally damages the staple, and for that reason is not recommended.

As a rule, it requires as many pickers as there are saws on a cylinder to keep a gin constantly running. Thus seventy-five or eighty pickers will bring in at night as much as the gin will run out the next day. But it is always better to let the cotton remain in the seed a month or more after being picked. The staple is of better color and weight.

DECEMBER.

By the middle of this month, the cotton is mostly picked. Now the corn and potatoes are gathered, and teams are active in hauling the crop to a market or shipping point. The baling is best done on damp or rainy days, as heat and dryness tend to extract the oil from the fibre. In some parts of the cotton region, it is advisable to put a small force to pulling up and burning the stalks as soon as picked, preparatory to another crop.

PART II.

DETAILS, DIFFICULTIES, IMPROVEMENTS, AND STATISTICS RELATING TO COTTON GROWING IN THE UNITED STATES.

CHAPTER I.

QUALITY, EXTENT, AND CHARACTERISTICS OF THE COTTON LANDS OF NORTH AMERICA.

That region of the United States where cotton is a profitable crop, is determined somewhat by soil, but much more by the intensity of summer heat, and the length of the growing season. The extremes of the cotton belt may be said, in a general way, to be the territory included between the thirtieth and fortieth degrees of north latitude. In other words, cotton can be produced with various degrees of profit throughout the region bounded on the north by a line passing through Philadelphia, on the south, by a line passing a little south of New Orleans, and on the west, by a line passing through San Antonio. This is the limit of the possibilities. Not more than one-half, and that the lower half of this territory, can properly be said to be suited to the growth of cotton.

An east and west line passing through Memphis divides the region where cotton growing is materially crippled by

the shortness of the season, from that in which the main difficulty to be contended with is soil, not climate. When the price of cotton is from ten to fifteen cents, there are parts of the valley of the lower Tennessee, a region between the Tennessee and the Mississippi, of which Jackson is the center, some bottom lands in the northern parts of Arkansas and in the southern part of Missouri, and a limited area in North Carolina, where cotton, at those prices, is a profitable crop.

But the Cotton States, properly speaking, are South Carolina, Georgia, Alabama, the northern part of Florida, Mississippi, the northern half of Louisiana, the southern half of Arkansas, and the eastern half of Texas. Within these limits, the question for the cotton grower is one of soil. He requires to know what parts of this large region afford lands sufficiently rich for cultivation, which are least exhausted, and what river bottoms are so raised, or protected from overflow as to be safe for locating a plantation upon them.

Beginning with the western limit of the region above described, let us move eastward towards the Atlantic States, considering the cotton growing qualities of each of the States above mentioned.

TEXAS.

The coast of Texas for fifty or sixty miles north-west from the tide-water line is low and flat. The soil is deep, rich, and black, suited to sugar cane as well as cotton.

But drainage is difficult, and much of this low surface is liable to be invaded by sea-water at high tides. If leveed from the sea, and ditched, it produces abundant crops, and enjoying, as it does, a sea climate, is, on that account, well adapted to the growth of Sea Island cotton. Geologically, all the coast of Texas, and the soil for a hundred and fifty or two hundred miles inland, is alluvial, being formed by the deposit of detritus of old rivers which

washed down the debris of secondary rocks. The bed thus formed was once under salt water, but by gradual upheaval, has been lifted to a moderate elevation. Thus, through a wide belt, Texas affords the advantages of an alluvial soil without the dangers of overflow, and free from the miasms of river bottoms.

While this description applies generally to the south-eastern half of the State, it should be stated that the extreme flatness of some of the prairies renders them unfit for tillage, and the bottom lands of the Guadalupe, Colorado, Brazos, and Trinity, especially the two latter, are subject to spring overflow. Yet after subtracting the flat prairie, and those overflowed bottoms which cannot easily be protected by levees, there remains a vast breadth of well-nigh virgin soil in this State admirably adapted to the production of a very fine staple of cotton.

Throughout this region, to which should be added the superior cotton lands near Red River, on the north-eastern border, the average yield per acre is seven hundred and fifty pounds of cotton in the seed, or about three-quarters of a bale of ginned cotton, which is more than double the average yield of either Tennessee or South Carolina.

As an unbroken body or strip of cotton land, probably the valley of the Brazos is not surpassed on the American continent. But a small part of it has yet been brought under the plow. The bottom is, on an average, including the second bottom which is fully as fertile as the immediate bank, five miles wide, and between three and four hundred miles long. Here are included a million of acres, almost every square rood of which can be plowed, and all capable of producing for a long series of years two bales to the acre. Thus two-thirds of the largest of American cotton crops might be grown in this valley.

Barely less productive than this bottom is a wide, but irregular body of lands, lying between the rivers, and known as the black rolling prairie. The dip of these sur-

faces is sufficient to give good drainage, yet not enough to produce washing. The soil is deep, mellow, and warm, and abounds in many places in small, white shells, showing at once detritus and sea-water action.

The diseases and enemies of the cotton plant have rarely shown themselves on these lands. They are easy of cultivation, and not remote from market, though less accessible than those of the Brazos and Trinity bottoms. At a low calculation, there are a million of acres of this description, east of the region of drought, as yet uncultivated, and held at moderate rates.

Then the bottoms of the Guadalupe, the Colorado, the Trinity, and the Red River lands, comprise another description of cotton soil, in some parts superior, and in others a little inferior to the black prairies. On the Guadalupe lands, it is indeed remarkable how little rain gives a crop.

I have seen six hundred and seven hundred pounds of ginned cotton per acre produced, without a drop of rain on the plants after they were six inches high. The quality of the staple thus grown is superior to that of a wet season; but corn is nearly an impossible crop under such circumstances. The Colorado River may be said to divide those parts of Texas that are sufficiently moist from those which suffer almost every summer from long droughts.

The eastern part of Texas, that is, the lands drained west into the Trinity, and east into the Sabine, is generally poor, covered to a great extent by the southern pine. Yet one-third, perhaps, of this surface, where the pine is considerably interspersed with oak, poplar, and magnolia, will produce from three to four hundred pounds of lint cotton per acre.

The northern and western parts of Texas, comprising probably two-thirds or three-fourths of the two hundred and thirty-seven thousand square miles in the whole State, are grazing and grain growing lands; but one-fourth of the

State, an area equal to the whole of Georgia, is admirably adapted to cotton, and capable, with due allowance for grazing land and edible crops, of yielding a larger supply of cotton than the whole South ever produced in one year.

LOUISIANA AND ARKANSAS.

Red River may be said, in a general way, to divide this State into two distinct regions, one adapted to the raising of cotton, the other of sugar. The part east of the Mississippi River, and south of the line of the State of Mississippi, commonly called the Florida parishes, having formerly made a part of West Florida, is to a great extent composed of cotton counties, but the principal part of the cotton crop of Louisiana, between two hundred thousand and three hundred thousand bales, grows in the Red River bottoms above Alexandria, and in the north-eastern corner of the State, a triangular extent of inexhaustibly fertile land, washed on the east by the Mississippi, and on the west by the Washita, and penetrated by the Tensas, the Little Tensas, Bayou Macon, and Bayou Boeuf.

This region is wholly alluvial, two hundred miles in length, with an average width of about forty miles, thus giving over five million acres, not more than one-tenth of which is incapable of cultivation. A greater part of it is, however, subject to overflow, the waters of the Mississippi being kept from it during several months of every year by high embankments, which are liable at any time, and at almost any point, to burst.

In a favorable season, these lands produce a bale and a half to the acre, but this region, called "the swamp" of Louisiana, is malarious, and, in winter, acute diseases of the lungs are very frequent, so that when the losses by overflow, and the disadvantages of sickness and almost impassable roads in winter, are taken into account, it may be doubted whether cotton growing is not, on the whole,

less profitable here than in the hill lands, where the average production is considerably less than a bale to the acre.

It will be observed that the Washita and its tributaries extend for a hundred miles or more into the southern part of Arkansas. This part of the State, embracing, perhaps, half of what lies south of the Arkansas River, is an excellent cotton region, not liable to overflow, except immediately on the Mississippi, and having a climate precisely adapted to the growth of the great staple. In the southwest corner of Arkansas, the lands on Red River, and the streams which empty into it, are also excellent as cotton lands.

They are, however, very imperfectly developed, never having produced more than one-tenth of the amount they are capable of producing. Their average production, the same with that of the Louisiana lands, is seven hundred pounds per acre of seed cotton.

This part of the State has an unenviable reputation with regard to health, but this difficulty may be greatly modified, and, perhaps, wholly removed, when the land is more extensively cleared, and reduced to cultivation.

Although most of the cotton of Louisiana and of Arkansas grows in the district bounded north by the Arkansas, and south by the Red, including the bottom lands of those streams, there is quite a breadth of land suitable to this crop on the south side of the Red. In the parish immediately south of this river, Pointe Coupee, which extends from the Mississippi to the Atchafalaya, the soil, one of great fertility, is about equally adapted to cotton or sugar, but the former is replacing the latter on a great number of farms. Cotton is raised nearly down to New Orleans, but the tendency is to a rank growth of the plant, and late development of the bolls.

From the result of some experiments made a few years ago on the Houmas lands, and communicated to the author by their former owner, Hon. John S. Preston, of South

Carolina, there is reason to suppose that a variety of black seed cotton might grow well on the heavy black lands of Southern Louisiana.

They have always been considered as sugar soils only, but Mr. Preston planted a considerable breadth of land near Donaldsonville with "Main" cotton seed, a variety finer than any green seed, but not equal to the genuine Sea Island. He found that in proportion as he *receded* from the river bank the plant flourished. The plants near the front were feeble, but in the rows that extended back nearly to the timber, a distance of from two to three miles, they grew better and better as the distance from the front increased.

The difference may be owing to greater freshness or more moisture in the land. If the sugar interests of Louisiana decline, as the prospect now is, it may prove a matter of great importance to know that black seed cotton will grow well on those strong lands. Some experiments are being made this year, (1867,) on these and similar soils in Texas with black seed cotton from Egypt, with what result remains as yet to be seen.

North of the Arkansas River, there is a territory resembling in its general features the cotton fields of Louisiana. It is drained by the White, the Saint Francis, and the Big Black, and produces several thousand bales of cotton, but is not likely to become remarkable for its growth of this staple.

MISSISSIPPI.

Coming now to that half of the cotton belt which lies east of the Mississippi River, we have the great cotton producing State, which takes its name from the river that constitutes its western boundary. And here, immediately east of the river, and north of Vicksburg, we find a territory whose general shape is that of an ellipse, Vicksburg being at the lower extremity, and Memphis at the upper,

which is wholly alluvial, intersected by numerous streams, and of enormous productive power.

The Yazoo is its eastern limit, and Deer Creek, Yalabusha, and its tributaries, the Sunflower, Coldwater, and Tallahatchie Rivers, permeate it in various directions. About two hundred miles in length, with an average width of twenty-five miles, it comprises over three million acres of soil, which is literally exhaustless, and situated in the very centre of the cotton belt.

The crop is more certain here than in any other part of the Mississippi Valley. It is, however, like the corresponding section in Louisiana and Arkansas, west of the river, subject to overflow, but does not require protection by such enormous and extensive levees as those which guard the lands on the west side of the river.

Leaving now this great alluvion, we come to a different class of cotton lands from any on the west side of the great river. The hills or uplands of this State are of far greater breadth than the submerged or alluvial lands, and some parts of the State are covered with almost unbroken forests of the southern pine. This is true of the fifteen counties that lie in the south-east corner. Placing these out of the account, there remains a range of counties extending diagonally across the State from Woodville to Holly Springs, in all of which cotton is grown in large quantities.

These uplands are, in their natural state, covered with a growth of white oak, red oak, beech, poplar, magnolia, with pine interspersed. The soil is very soft and friable, so that the surface, unless plowed with care, is soon ruined and cut to pieces by the washing of the winter rains.

When properly cared for, however, they deteriorate very slowly in cotton culture, many of them being now fully as valuable as they were from thirty to fifty years ago, when they were first opened. The average crop of this class of lands in Mississippi is about half a bale of

ginned cotton to the acre. The average product per acre throughout the State, according to the census of 1850, is six hundred and fifty pounds.

Along the north-eastern limit of the State are lands which drain into the Tombigbee. This is an excellent cotton country, the climate being exactly suited to the plant, and the soil remarkably soft and light.

ALABAMA.

This State and Mississippi are remarkably similar in situation, and in the amount and quality of cotton which they produce. Both extend to the Gulf on the south; both are bounded on the north by Tennessee; both have a large extent of poor land occupying the south eastern angle of their territory. The north-eastern part of Alabama is rough and unproductive, except in a few valleys of limited extent, but on the northern border is the most southern curve of the Tennessee River, whose valley affords much good, though not first-class, cotton land.

As in Louisiana, the rich cotton lands of Alabama are confined to an angle of the State. The bottoms of the Tombigbee and Alabama, and the irregularly shaped triangle that lies between the lower parts of these streams, send by far the greater part of the cotton of Alabama to market. With the exception of the limited region around Huntsville and Tuscumbia, in the northern part, there is not a great deal grown north of the thirty-third degree of north latitude, or the line which, continued west, divides Louisiana from Arkansas. The tenth degree west of Washington, which corresponds nearly with a line connecting Decatur and Pensacola, divides the State about equally, east and west. The south-western quarter of Alabama as thus bisected in each direction, is equalled only by the rich black prairies of Texas as cotton soil.

The alluvions of the rivers are, of course very rich and

strong. In some cases they are subject to overflow, and in others the drainage is defective, especially on the Tombigbee.

But near the centre of the State is a tract of land extending about forty miles in each direction, giving something like sixteen hundred square miles, or more than a million acres, which, all things considered, is the best cotton land in America, and probably in the world. From a large county of that name these are frequently called the Marengo lands.

The soil is deep, rich, and black, covered, in its natural state, with a dense growth of cane, rolling so as to give sufficient drainage, yet never steep enough to wash. Every square foot is capable of culture. The Tombigbee on the west, and the Alabama on the south-east, both navigable the greater part of the year, give prompt and cheap access to Mobile, the export town. Entirely above overflow, and remote from lakes and marshes, it is a much healthier region than the cotton fields of the lower Mississippi. The most of this favored section lies between the thirty-second and thirty-third degrees of latitude, the very centre of the cotton belt, where the length of the season is exactly adapted to cotton. More of these cane lands of Alabama, in proportion to the whole area, are in cultivation than is the case with the other cotton fields on the Mississippi and west of it, which have been described. They produce always a bale, and, in the best seasons, a bale and a half to the acre. The rains of winter convert the roads into quagmires, but in summer they become hard and glossy, as firm as a floor, and entirely free from dust.

The productive capacity of this part of Alabama alone cannot be much less than three-fourths of the whole number of acres, for, allowing two acres in cotton for one in corn, these cane lands would yield seven hundred and fifty thousand bales.

The bottoms of the Alabama, near Montgomery and

Wetumpka, are wide and very productive, but farther north, the good cotton lands decrease in amount, there being in this part of the State many pine and black oak barrens, where half a bale per acre is a good yield; but the valley of the Coosa is good land, as far up as Rome, in Georgia.

GEORGIA.

This State is naturally divided into three parts or sections; southern Georgia, middle, and northern Georgia, or the Cherokee lands, as they are familiarly called. A line drawn westward from Charleston or from Beaufort separates the most of the flat pine barrens from the better parts of the State, which lie north of such a line. The Cherokee lands may be described, in a general way, as that part of the State lying north of the thirty-fourth parallel, or an east and west line passing through Marietta.

These northern lands, being situated among the spurs and foot-hills of the Alleghanies, are high and rough, well adapted to grazing, corn, and wheat, and but ill suited to the production of the great southern staple, which flourishes best on lands that are unsuitable for wheat.

The climate of southern Georgia is, of course, well adapted to cotton, but the difficulty is with the soil. In the valleys of the Chattahoochie, the Flint, and on the waters of the Altamaha, there are many rich bottoms, but rice is found to be a more profitable crop on many of these lands. The region about Columbus, however, is a good cotton soil, and a large amount is raised in that part of the State. The good and the poor lands of Georgia are more mixed than in any of the south-western or new States, but in a general way, the middle counties of Georgia are the cotton counties. The natural growth on these lands is white and red oak, chestnut, hickory, poplar, sycamore on the water courses, with pine on the poorer lands, and black jacks on the barren hills.

Many of these lands are of a very red color, and wash quite easily. As they have been many years in cultivation, and much abused, particularly in the mode of plowing, they are not at present remarkably productive. The average yield is something like two-thirds of a bale to the acre. Cotton planting in Georgia has never been conducted with the same exclusive devotion to the growing of a single staple, as characterizes planting in the southwest.

The farmer in Georgia is in the habit of raising wheat, oats, potatoes, and sometimes tobacco and hemp, cotton being only one of his crops. There is not a great deal of undeveloped cotton land in Georgia. A careful system of plowing, with proper rotation, may keep the annual production of this staple from falling off.

SOUTH CAROLINA.

The surface of this State, like that of North Carolina, its northern boundary, and Georgia, its western, is divided into three parts or species of land, the low lands, the middle counties, and the mountains. The coast, for something more than a hundred miles back from the water line, including the counties of Beaufort, Colleton, Charleston, Georgetown, Horry, Marion, Williamsburg, a part of Orangeburg and Barnwell, is low, swampy, fertile, and sickly. On the bottoms of the Edisto, the Santee, the Great and Little Pedee, and Lynch's Creek, rice is the principal crop. The lower corner of the irregular triangle which forms the State of South Carolina, or, in other words, that part of the State which lies south of the line connecting Augusta and Georgetown, affords in many places a soil and climate admirably adapted to the black seed or Sea Island cotton.

Edisto Island, south of Charleston, is the best locality in the United States for this variety of cotton. It is produced as far up the Savannah River as Barnwell district.

The region lying directly north of Barnwell and Charleston, that is, the counties of Kershaw, Sumter, Darlington, Chesterfield, Fairfield, Edgefield, and two or three others still farther towards the mountains, is admirably adapted, as respects climate, to the production of the ordinary green seed staple, but only small portions of the surface present a superior soil.

Like the corresponding cotton counties of Georgia, these South Carolina lands are by no means uniform in their appearance or value. The bottoms of the Savannah, Saluda, Congaree, Wateree, Catawba, and Lynch's Creek are, like all other alluvions, remarkably fertile and productive. But between these streams there are extensive tracts on which hardly anything grows but the southern pine, and in those counties adjacent to Georgia there is much red land, as it is called, which originally was of fine productive power, but by injudicious cropping, and by washing, to which the soil is very liable, its value has greatly deteriorated. Much of this region has been in cultivation for nearly a hundred years, but the bottom lands still yield a bale to the acre, and the average throughout the State, in a favorable season, is three hundred and twenty pounds. In the upper counties, near the Blue Ridge, neither the soil nor climate is well adapted to cotton, this region being devoted principally to grain growing and stock raising.

Notwithstanding the length of time for which the State has been settled, there remains a very considerable breadth of undeveloped land, capable of producing three hundred pounds and over per acre.

NORTH CAROLINA AND TENNESSEE.

There is but a moderate extent of land in either of these States adapted to cotton. The river bottoms above Wilmington, and some of the midland counties of North Carolina, produce quite well. But in those parts where the climate suits cotton, the soil is too poor to pay for cultiva-

tion. The average throughout the State is about two hundred pounds per acre, but there is very little to attract or retain planting enterprise on these lands, when such regions as are above described lie open and inviting in the Southwest.

Passing west of the mountains, one descends the western slope of the Cumberland range, and approaches to within thirty miles of Nashville before a cotton soil is reached. Near the Alabama line, the climate and soil are both quite favorable, and west of the Tennessee, near Memphis, and around Jackson and Paris, it is the staple production. The Tennessee lands that yield over half a bale per acre are not extensive. In Middle Tennessee one hundred and fifty pounds per acre is fair cropping; but the bottoms of the Mississippi and the Tennessee have not been found sufficiently fertile to bring the general average of the State up to three hundred pounds, less than half of the average Texas crop.

COTTON NORTH OF 38°.

The successful cultivation of cotton depends on the length of the season more than any one thing. It requires four months from planting to the opening of the ground bolls. Then, in order to raise anything like a full crop, two and a half or three months more are needed for picking it out. In the best part of the cotton belt the chief dates in the calendar are as follows:

Planting, about the first of April.
First bloom, early in June.
First open boll, early in August.
Picking commenced, middle of August.
First killing frost, first to middle of November.
Crop gathered, middle of December.

The effects of shortening the season, as thus allotted, are, in the first place, to give less time for maturing cotton before frost, and to make the cotton which is forced open

by frost, not by natural maturity of the boll, inferior in staple as well as diminished in bulk.

Suppose, for instance, cotton is planted on the first of May, in a climate where corn is planted about that time. It has May, June, July, and August to grow in.

If the heat of those months is as great as in Memphis, for instance, the plant will begin to open in September, and there may be two weeks or more when fifty pounds per day will be picked by each hand. But weather cool enough to stop the growing of the plant, must come in October, and, perhaps, not later than the middle of that month, a frost which will force open the immature bolls. Then follows a second picking of short, kinky cotton, clinging to the inner surface of the pods.

When cotton is from thirty to fifty cents a pound, this may pay. Two hundred pounds per acre may be produced in this way. At thirty cents per pound, this would give sixty dollars as the income from one acre. Of wheat, at two dollars, it would require thirty bushels; of corn, at fifty cents, one hundred and twenty bushels, to give the same result.

The above supposition is the most favorable that can be expected north of 38°. In the spring of 1862, cotton seed was planted quite extensively in Maryland, Delaware, and in Southern Illinois. The fate of a large majority of these experiments may be summed up as follows: the plant grew well and looked green, but developed little or no cotton till frost, when quite a number of pods that were nearly mature opened, and with cotton at fifty cents a pound and over, the result was moderately remunerative.

In Delaware, where the sea air imparts greater mildness to the climate, quite good cotton is raised by forcing the young plants in a rich bed on a sunny exposure, and transplanting after the manner of tobacco. The southern extremity of Illinois is less than fifty miles from Tennessee, where half a bale to the acre is produced, and in parts of

Missouri, north of 38°, nearly as much has been grown in a fortunate season.

CHAPTER II.

ENEMIES AND DISEASES OF COTTON.

There are five small animals or insects that afflict, and sometimes wholly destroy, the cotton plant. These are the cotton louse, the cut worm, the cotton worm or moth, (for the worm is the offspring of the moth,) the army

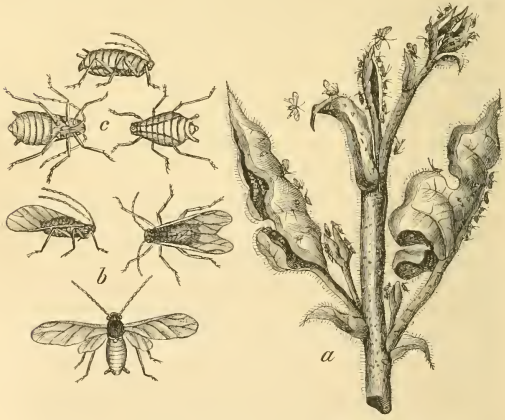

Fig. 14.—THE COTTON LOUSE.

DESCRIPTION: *a*, young shoot of cotton plant, with lice of natural size; *b*, winged lice, magnified; *c*, wingless lice, magnified.

worm, and the boll worm. We are indebted to Prof. Townend Glover, of the Department of Agriculture at Washington, for the opportunity to copy from his original

engravings the insects of which cuts are given in this chapter.

Of the first, little, perhaps, need be said. It is a small, gray louse, that attacks the plant when very young, and is generally found upon cotton that is unfavorably situated with regard to soil and moisture.

Where there is a rich but wet bottom from which fine returns may be expected, and copious rains follow the planting, the young sprouts will have a sickly and rusted look, and grow very slowly. Upon examination they will be found to be suffering from the louse.

The first remedy, and that which is generally effectual, is careful culture. The earth should be loosened around the young plants, and, if the stand is very thick, it should be thinned. In many places these early troubles of the cotton plant result from an exhaustion of some of the constituents of the soil which cotton demands.

Ashes and plaster are the best fertilizers of young cotton, and they would probably, if sprinkled dry upon the plant, destroy this little vermin. It is recommended, then, to dash or dust upon young cotton plants that are afflicted with the louse or the sore-shin, a mixture of dry wood ashes and plaster of Paris. Let it be done immediately after the first plowing, and before the hoes go over the crop, as this will give the hoe an opportunity to mingle the fertilizer with the soil around the roots of the plant.

THE CUT-WORM.

This animal is about an inch long, of a dull, leaden hue. He burrows in the earth, is of a slow and torpid nature, and proves himself the enemy of the cotton plant almost as soon as it appears above ground. From that time for a month he shows his mischievous nature by biting the tender stalks just where they emerge from the ground. Generally he inflicts a severe wound, but quite often sev-

ers the stalk from the root entirely, and is for that reason very appropriately called the Cut-worm.

Fortunately, there is a remedy for the depredations of this little reptile, which is easy of application, and in most cases a specific; though where the crop is large, there may be a practical difficulty of obtaining a sufficient amount.

Ashes or *lime*, or a combination of both these fertilizers, will at once hasten the growth of the plants that are uninjured, and render the soil so alkaline as to be quite disagreeable to the villainous little creatures. If they appear in all parts of the field, the planter should obtain enough wood ashes to mix with an equal quantity of lime, and thus make a dressing for the entire crop. Let a hand follow the plows, dashing the mixture near the roots. The hoes should follow and blend the fertilizer with the soil in such a way as to fit it for ready absorption, and at the same time make the immediate vicinity of the root distasteful to the Cut-worm.

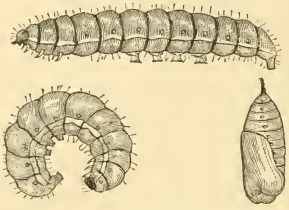

Fig. 15.—CUT-WORM AND CHRYSALIS.

THE COTTON MOTH.

Sometime in August, when the planter, moving over his crop, begins to see, now and then, an open boll, he may notice here and there a gray, harmless looking moth or miller, early in the morning or in the evening, flitting about, in a careless way, over the plants. In a few days after, some worms will make their appearance in different parts of the field, but their ravages will be inconsiderable, not sufficient to excite alarm except with the experienced observer.

These worms will disappear in a few days, and the sanguine planter may be feeling quite sure of an abundant crop. His neighbors may be congratulating him, and he may write a flushed letter to his factor in the city;

> * * * "and as his crop puts forth
> The tender leaves of hope, to-morrow blossoms
> And bears its blushing honors thick upon it:
> The third day comes" ——

not a killing frost; but a visitation that is just as fatal to the cotton-field and its crop, as though, in the midst of that glowing midsummer, the thermometer should suddenly drop to the freezing point.

When the cotton worm is fairly developed and begins his ravages in earnest, the planter has nothing to do but to sit by and witness the havoc. Then his labors are impotent, for his enemy is unconquerable from the sheer vastness of his force. His numbers are in millions and tens of millions; every plant, and almost every leaf, is swarming with them, and in three days he may behold a magnificent field, embracing perhaps a thousand acres, standing perfectly leafless, with no possibility of affording more than an eighth or a tenth of a crop.

This is an enemy that admits of no delay; he must be met at the outset, and fought in every way by which there is any likelihood of conquering him. Those few harmless looking millers were the mothers of the first crop of worms. They produced a large generation of millers, who, in time, became the parents of that enormous host of devourers.

Let us describe this harmless looking fly a little more fully, so that the planter, to whom she is fortunately not familiar, may recognize her and give her a proper reception. An intelligent planter, who lives just above Port Hudson, in a region that has suffered very much from the ravages of this worm, has given the following description, which will enable the inexperienced to become duly warned.

"The cotton fly belongs to that numerous class of insects known to naturalists under the term of *phalena*, or moth tribe. The following are its specific characters, described without technicalities. The little horns projecting from the head, terminating in a small point like a bristle, are of a drab color, half an inch long, and about half the length of the body, which measures nearly an inch; the under surface of the breast is of a dull silvery white, gradu-

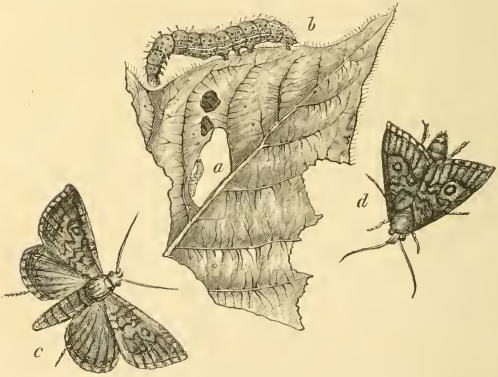

Fig. 16.—THE COTTON MOTH AND CATERPILLAR.

DESCRIPTION: *a*, young caterpillar after moulting its skin once; *b*, full grown caterpillar; *c*, moth in motion; *d*, moth at rest.

ally terminating on the belly and wings in a color tending to russet. The upper surface of the wings and back varies somewhat in different individuals, but is generally of a changeable golden color, with rusty, zigzag lines; the tips of the wings are bordered with a narrow strip of pale pink color, and slightly notched. On the upper surface of the wings there are two black spots, one on each, about the middle of the widest part, or that towards the tail. The legs are white, the four posteriors very long

when compared with the front ones, which are short and slender; the tail is simple, that is, undivided. The length of this insect is about an inch from head to tail, and the wings, when expanded, are of about the same width. To conclude, I will add, that the shape of this moth is very much that of an isosceles triangle, with the line forming the base bent in about a quarter of an inch. This peculiar figure is produced by the outer angle of the upper wings projecting beyond the inner angle."

There are two general modes of attack; one is to make war upon the moth itself and destroy as many as possible before they lay their eggs, about the last act of their lives, which extend through ten days. The other is to hunt out their little nests on the cotton leaves and destroy them. Though depending for its existence entirely upon cotton, which is a tropical plant, this fly and the worm which is produced from it, does not seem to enjoy the hot sun. The worms sometimes perish in passing from one plant to another if the sun falls full upon them, and the moth is most likely to be found in the morning and the evening.

Let the laborers go out very early, and start into the field in a line between the rows, each armed with a wide shingle cut away into a handle at one end. As they move forward, the moth rises from the leaves, and can be struck down and killed with the paddle.

Another method is to mix molasses, vinegar and cobalt in such proportions as to make a sticky mass. Expose it in plates, each set on a board, which is nailed to the top of a stake. Some planters recommend that they be used as thickly as a plate to an acre. The moths are attracted to these plates, and falling in, become fastened and perish. Fires in the fields have been recommended as attracting and destroying this moth; white cotton flags, about a yard square, are also said to allure the insect, and serve as deposits for their eggs.

It will not do to rely upon either of these modes, as

some will escape the paddle and fail to get into the molasses. Fortunately the places where the mischievous creatures lay their eggs, are easily found. She cuts the mid-rib or main fibre of a leaf and bends it over, tying it down with a little thread, and beneath this shelter tent deposits the tiny atoms that, in ten days, become worms. They are protected also by a few threads laid over them. The cutting of the fibre and bending over of the leaf is a sure sign that immense mischief is hatching, and if in walking through a number of rows many such leaves are visible, the planter should start in his whole force with cotton bags, instructing them to hunt for all such leaves, pick them, bring them all out, and burn them.

It is impossible to predict when and where this pest will appear, or whence it comes. It was not much known, at least in the Southwest, before 1820. Since then it has made irregular but quite too frequent visits, sometimes destroying thousands and tens of thousands of acres. The worm grows very rapidly, is of a brown color with dark stripes, about an inch long, and looks some like the apple tree worm that infests orchards.

It generally occurs that a few appear and pass away some time in August, and then, if nothing is done, the attack in mass comes early in September. Where there is a large crop to be saved, it would be advisable to take those few plants upon which worms first appear and entirely destroy them. By this mode, the second generation of millers would be considerably reduced in number, if not quite exterminated.

There is something remarkable in the way in which one of these countless generations provides its own destruction without leaving even a representative.

The first moths that visit a crop deposit their eggs and die. These eggs, in ten days, become little worms, which fall to eating the leaf on which they were hatched, and as they grow, consume the plant and pass to another.

But age comes on apace with these ephemeral creatures; the worm presently grows weary of devouring, selects a leaf, rolls himself in a little cocoon, and dies. From each of the cocoons, in a few days, a moth emerges, and these deposit the eggs from which the devouring host is hatched. But their numbers and their voracity now become fatal to themselves as well as to the crop on which they feed. They consume the last leaf on the last plant of a field, leaving no place upon which their cocoons can be deposited. If, by accident, a few moths should be reproduced, they would find no pasturage for the young to be hatched from their eggs, for the creature can eat nothing but cotton. When the growth of a field is consumed, they start away feebly for another range, but the first fence or ditch arrests them. The sun kills them, the birds pick them up, the wheels of a wagon, passing along a plantation road, crush millions of them; so that in two days from the time the crop was devoured, not one of the voracious army may survive. They perish as utterly as the hosts of Pharoah, and the discomfited planter is reminded of

> "The sojourners of Goshen, who beheld
> From the safe shore, their floating carcasses
> And broken chariot-wheels."

Those who have studied the habits and peculiarities of this insect, have arrived at the following conclusions:

1st.—That nature has made no provision by which either the fly, the worm, the chrysalis, or the eggs, can survive the winter or exist for any length of time where the cotton plant is not a perennial.

2d.—There is no regularity in their advent, no law that seems to prescribe the times of their re-appearing.

3d.—Their progress is from north to south, and from west to east. That is, in the United States, the cotton of Louisiana and Texas is liable to suffer the first attack, and the fields of Arkansas, Tennessee, and the Carolinas, will

be invaded, if at all, so late in the season that the ravages of the worm are only a little before frost, and but moderate injury is produced.

4th.—It probably originates in Mexico and South America, and from some unknown cause occasionally migrates northward.

THE ARMY WORM.

Without pausing now to speculate or sum up the observations on the origin of this devourer, it will suffice to

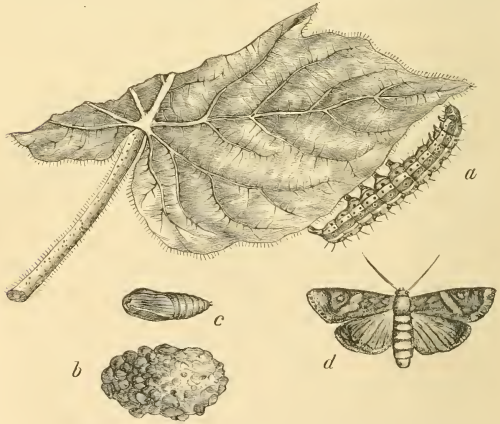

Fig. 17.—THE ARMY-WORM AND MOTH.

DESCRIPTION: *a*, the caterpillar, or army-worm; *b*, cocoon formed of particles of earth cemented together with silk or gum; found under stones or in the earth; *c*, chrysalis; *d*, moth. The moths vary very much in color and markings.

remark that he differs both in appearance and habits from the cotton worm or caterpillar described on the foregoing pages. Of voracity equal to that of the cotton worm, he is a general consumer of every green crop in the line of

his march. He is much longer lived than the caterpillar, and can travel much faster, overcoming greater obstacles in his path. He resembles the cotton worm in coming from the South northward, and in the countless myriads with which he invades a crop.

The Army-worm is not so subtle or difficult an enemy as the former. The force advances by regular marches from one field to another, and does not send out breeders in the form of a moth to deposit eggs throughout a field. The planter may hear of his advance from afar, and have a number of days or weeks to prepare a suitable reception for the enemy.

The most effective obstacle that can be interposed in the path of the Army-worm is a clean cut ditch, of moderate depth, but with smooth, perpendicular faces. As a precautionary measure, many planters cut such a ditch all around their place, or at least on the southern and western exposure. But the washing of winter rains and the growth of weeds and bushes will remove the earth from the sides, or bridge over the ditch so as to make it useless without prompt working. Whenever there is any likelihood that a plantation lies in the path of such an army, let the plows be started on the side of the field in the direction of the enemy, and throw out a wide furrow from the field. The plow should go two or three times over the same ground, and be followed by hoes and spades, cutting down the ditch a foot or eighteen inches deep, care being exercised to make at least the inner wall or face quite perpendicular and smooth. It will sometimes happen that the southern or western extremity of a field is invaded before the farmer or planter has had sufficient warning to make ready for them. In that case let him take a lesson of decisive fire engineers, when laboring to stay a conflagration, which is spreading before the wind in a populous city.

With a proper estimate of the rate of advance of the enormous horde, let him select a path, and send a force to

cut down and throw towards the army two or three rows of cotton. Then let the plows, hoes and spades, follow rapidly, and cut the ditch as soon as possible. Sometimes it may be necessary to keep the plows in constant motion in order to bury the advance guard and give time to complete the ditch. Another precaution, which many employ, is to scatter straw or dry sedge grass in the ditch and renew it when burned, so as to keep a bed of hot cinders, or a line of fire in front of the threatened field. As the whole farm is in danger, as well as the cotton field, the Army-worm devouring corn, grass, gardens, and stacks of fodder that lie in his path, an attack of this character imposes the most strenuous and constant activity on every one that can lift a finger in the contest. A patrol with the plow and spade, should be kept up along the line of the ditch.

The Army-worm hardly needs a formal description. No other reptile moves, as he does, in such enormous force. He is of about the length of the little finger of a man, and nearly as thick, yellowish in color, with a single dark stripe along the back. He travels by bending up the back and drawing the last feet nearly up to the head, then throwing the head forward, thus measuring his length from one point to another.

There appears to be no bird, but the blue jay, that will eat it. Hens and turkeys look upon it with curiosity or fear.

THE BOLL-WORM.

Unlike the caterpillar and the Army-worm, the Boll-worm is an annual pest of the cotton plant, hybernating in the ground, and commencing depredations as soon as the young forms begin to swell. He never destroys a crop as they do, but pierces three, four, or sometimes ten bolls, nearly or quite killing them, at length penetrat-

ing to the centre of a full grown boll, where he lies concealed till near the time of his transformation.

The peculiarity of this worm is that his natural food is corn, which he always prefers, but will attack cotton if the other plant is not at hand. The moth which produces the worm is thus described by a planter in Jackson, Mississippi, who has evidently made the subject a study. "Of a pale yellow or shining ash color, length of body and wings an inch and one eighth, the wings expanded two inches, the upper covering the lower. Below the centre and near the border of the upper wings are two dark spots, with two or three indistinct ones on each upper wing; end of the wing whitish, having a wavy dark band near the border. Throat a little convex, downy; abdomen color of wings and downy; proboscis folded spirally underneath, double, half an inch long; eyes large, clear yellowish-green. Six legs, antennæ fusiform; lies concealed in the day in fence corners and around stumps, flies only late in the evening and at night near the ground and rapidly."

In the early part of July this moth pairs, and in four days lays about seven hundred and fifty eggs, soon after which it dies.

These eggs are deposited on the silks of corn. In three days they hatch, and the young worms commence feeding on the green corn and the silk. Remaining here about two weeks, the worm then goes down into the ground to the depth of three inches, where it is transformed into a chrysalis of bright mahogany color and conical shape, and about an inch in length. In sixteen days, the moth above described bursts from the crysalis. The moth of the second generation finds, at this time of the year, little or no corn in the silk, in the cotton latitudes, and in the absence of its favorite plant, lays its eggs on the top bud or on the ends of the side buds of the cotton plant.

At the time of this deposit, if the weather is dry and

the sun very hot, most of the eggs perish or become abortive. This is the reason why moist weather in August forebodes an attack of the Boll-worm. But no season is so hot and dry but some worms will be hatched, and they commence to spread downward upon the plant and commit depredations on the boll.

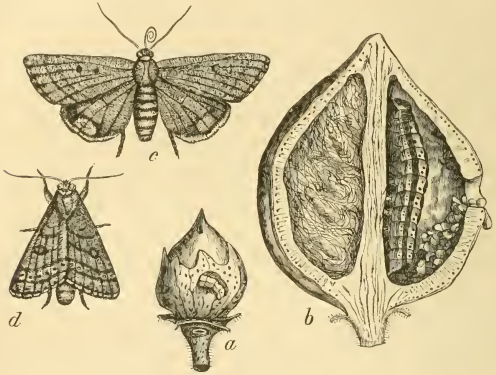

Fig. 18.—THE BOLL-WORM AND MOTH.

DESCRIPTION: *a*, the young worm eating into the young boll; *b*, full grown boll with hole eaten in the side, containing the Boll-worm after shedding skin the 4th time (19th day), with feces in boll; *c*, moth in motion, and *d*, at rest.

The Boll-worm is thus accurately described by Mr. Boddie, of Jackson.

"The larva or caterpillar, when full grown, will measure from an inch and a half to an inch and three quarters in length; it looks, to a superficial observer, brown, pale yellow and light green, though it has eight longitudinal streaks of white, brown and green, with one or two dots on each segment of the body along the lowest streak. It is smooth, shining, naked, with a few hairs on each segment of the body. It is of a cylindrical form, tapering a

little at each end; rather thick in proportion to its length, and has six legs in the fore part of its body, eight at the middle, and two near the tail. The head is brown, smaller than the body, and oval in shape."

After thus destroying from one to eight or ten bolls, the reptile descends and rolls himself into a cocoon or egg in which to get through the coming winter and spring; for nature prepares no food for him during nine months of the year. The eggs or cocoons that hybernate, must be hidden in the neighborhood where the perfect insect lived, that is, in the cotton-fields or near them. It is doubtful whether any are hidden in the soil of the corn-field where there is cotton anywhere near; for, after July, the animal entirely deserts corn, and goes to the cotton-fields. This is the case, at least, in the district where cotton flourishes best, for there the corn nearly all hardens late in July or early in August. Thus, in the northern part of the cotton belt, as Tennessee and North Carolina, the Boll-worm does little injury to cotton, for there he can find green corn till quite late in the season.

These preferences and habits of the Boll-worm understood, it is not so difficult to prescribe a course of treatment that will rid the cotton-fields of his presence.

There are two modes, and, so far as now known, but two modes of expelling this pest; one by starving or killing the moth, the other by drawing it to corn, its natural food, and keeping it there.

Rotation of crops, managed so as to place the corn at some distance from the cotton, and throwing out the cotton-field to lie fallow a year, will destroy almost all the eggs of the Boll-worm.

Suppose that a cotton farm is so far remote from others as to enable the planter to interpose a mile of wood land or pasturage between the cultivated fields of each. In September, the worms descend from the bolls and enter the ground. Let the ground lie fallow, or be sowed with

oats the following year. In August, when the moth emerges from the ground, she may find neither corn nor cotton within a mile upon which to deposit eggs. Her flight is low, and her days are brief. The chances are, that she will perish before reaching either of the plants upon which she and her young feed.

The exposure of a mixture of molasses and cobalt, with a little vinegar, at the edge of a cotton field, and nearest the corn from which they migrate in the latter part of July and first of August, would probably attract and poison large numbers of them. By carefully noting the time of their moving upon the cotton, it might be effective to send out early in the morning the whole force with paddles or little hand-nets, to walk abreast down the rows next the corn, and catch and kill them as they fly up. Where corn and cotton are adjacent, the moth settles in the first rows of cotton as soon as she leaves the other plant, and by patroling these rows every morning, the most of the invaders might be destroyed.

Another mode of overcoming the difficulty, would be to provide other and more attractive pasturage for them than the cotton boll. This could be done by having a small field of late corn next the cotton, that would be in silk as late as the latter part of August or the first of September. The worm would not be likely to leave the corn for the cotton, until it was too late for him to work much injury.

The same might perhaps be better attained by having rows of late corn, at intervals of twenty or thirty feet, through the cotton-field. This arrangement would be sure to draw all the moths, late in the season, to that field. Their cocoons would be buried in the soil, and by turning out that field to rest for a year or two, and transferring the crops to some distance, the race of Boll-worms on that place might be exterminated.

The diseases of cotton are not generally as destructive

as its enemies from the animal kingdom. Few crops are ever *destroyed* by anything but the caterpillar or the Army-worm; the "sore-shin," the red and brown rust, the dry rot, and the "cotton blues," damage a crop in various degrees, sometimes ruining a part of a field, or cutting off a number of bolls from each plant.

As these diseases are easily recognized when they make their appearance, and as little can be done towards arresting their progress when once developed in a crop, the attention of the planter should be turned mainly to the best means of providing against their return.

"An ounce of prevention is worth a pound of cure."

Rust, on the cotton stalk, is a small parasitical fungus or morbid growth, like lichens on trees, that springs up and materially checks the advancement of the plant by absorbing its juices. This fungus is produced by a diseased state of the plant, which may arise in various ways, but principally from a stagnation in its growth and insufficient supply of some of the elements of vegetable life. This stagnation may be produced by a singularly unfavorable season, but it is more likely the consequence of an unwise system of cropping and bad husbandry.

"Defective cultivation," says Professor Harper, of the University of Mississippi, "is the reason of ninety-nine cases of rust in cotton, while one is owing to an unfavorable season."

The "sore shin" is an affection of young cotton plants, very similar in appearance, and probably of the same origin as rust.

"Rot, or gangrene, is a decay that attacks the top bolls. The seed and lint first rot and turn black; then a sore or scab appears, resembling a puncture with a sharp instrument. This extends quite over the surface of the boll, and very frequently, after the disease has taken possession of the whole pod, it opens its prongs and represents a thoroughly rotten state in all its parts."

This account of the disease by an Alabama planter was given with a view of eliciting information on the subject. No careful examination of this affection has ever been made, or at least given to the world, and all that can be said by way of suggesting a cure is, that proper cultivation, and an application of just those fertilizers which cotton demands, will give partial, if not entire relief.

Sometimes in July and August, when the cotton should be maturing rapidly, there will appear a change in the color of some parts of the field. Instead of a deep, healthy green, the plants take on a dull slate or leaden color; the strength of the soil seems to expend itself on the woody fibre, not in maturing the bolls.

The planter calls this "blue cotton." At other times, depending perhaps on a very wet season, the plant, after growing several feet, and bearing well, sheds all its fruit and becomes blue.

As the remedies for all these diseases of the cotton plant may be summed up in one phrase, the improved and scientific culture of cotton, that wide field of inquiry and suggestion, must be remitted to the succeeding chapter.

CHAPTER III.

IMPROVED AND SCIENTIFIC CULTURE OF COTTON.

Though cotton is the great American staple of export, and has been proclaimed a King in the commercial world, no leading crop of the country has been so little studied by scientific men, and none has been cultivated with so little reference to fundamental principles of agricultural chemistry. Three reasons may be assigned for this somewhat surprising fact.

First.—The class of labor that has hitherto been applied to cotton raising, was, in the last degree, rude and unskilled. Science and judgment on the part of a proprietor or agent is of little avail, unless the hand that does the work is guided by a thinking brain.

Second.—On account of the opening of vast and still vaster regions blessed with a virgin and inexhaustible soil in the Southwest, which could be obtained at almost nominal prices, there was no necessity for a system of culture in the older States that should keep the land in undiminished productiveness. Why should the cotton grower on the old red lands of the Carolinas and Georgia labor to redeem his acres from the effects of past errors, fill the deep gulches, prevent washing, exterminate the sedge grass and the stunted pine and black oak bushes, and restore the potash, lime and phosphorus drained from the soil by long cropping without fertilizers, when a few hundred miles to the Southwest lay those wide savannahs and broad alluvial bottoms, teeming with tropical luxuriance, to which the Government would give him a fee simple for a dollar and a quarter an acre?

Third.—Cotton is not a rapid exhauster of any soil. Compare for amount of mineral and organic matter removed from the soil, the potato crop with the cotton crop. The stalks of cotton and of potatoes are alike returned to the soil. An acre in potatoes yields, in tubers, say ten thousand pounds weight, which is wholly removed. Three-fourths of this is water, leaving twenty-five hundred pounds dry and mineral matter. In cotton, the same acre would yield a bale, or four hundred pounds of lint. The weight of the dry seed would be about three times that of the lint, that is, twelve hundred pounds. Add the weight of the lint, and the sum is sixteen hundred pounds. Thus, compared with the potato, the removal is as sixteen to twenty-five.

But in the rudest agriculture ever practiced on cotton

soils, the custom has been to plant six, eight, or ten times as many seeds as were expected to become plants. In other words, of the twelve hundred pounds of seed taken from an acre, a thousand pounds were returned to the soil as a fertilizer; so the real removal was only six hundred pounds from an acre, that is, as compared with the potato, six to twenty-five, or about one-fourth.

The preservation and restoration of cotton lands depends on two practices, one mechanical, the other chemical; the former involving no expense other than a little well directed labor, the latter the restoration of a few pounds of potash, lime and phosphorus, to each acre from which a crop has been taken.

Of the two, probably the former is as important as the latter; on hill lands very much more so.

Under these two heads the subject will be considered.

First.—Circle plowing and ditching.

Second.—The nature and amount of fertilizers required by cotton.

Several circumstances conspire to make the deterioration of upland cotton soils by washing very great. In the first place, the cotton soils are all soft, light, and porous, "as mellow as an ash-heap." In a natural state, they are kept in place by the roots of the trees, leaves, and the tough cane roots, and fallen canes, which are the natural growth of that climate and soil.

When all these are removed by clearing and the plow, what should keep the mould from being carried by the washing of copious rains down the sharp hill-sides, and swept away into the swollen streams?

Consider, also, that the requirements of cotton call for frequent plowing and hoeing; so that all weeds and grass are destroyed, and no little roots remain to hold the surface in a sod. The cotton root is small and smooth, going directly down into the subsoil. Nor is the surface of the country locked up from the abrasion of the rain, by those

penetrating frosts that, north of the Ohio and the Potomac, for four or five months of each year, keep every pebble in place, and open the surface in April in precisely the same condition in which it was left in December.

It would not seem to demand any remarkable inventive power to accommodate the mode of plowing to the requirements of the cotton soil in the United States; but nothing like circle plowing has been in general practice until within twenty years past.

The State Geologist of Mississippi, in that part of his report which relates to cotton culture, says the idea was first suggested by Thomas Jefferson, who had seen the peasants of France conforming the curve of their furrows with the slope of the hills on which they were plowing. Mr. Jefferson was, for many years, a correspondent of Sir William Dunbar, who had extensive plantations on the steep but fertile hill lands that extend from the Mississippi River, near Natchez, eastward to the Pine woods, which, at the distance of thirty miles from the river, cover the greater part of the country. Mr. Dunbar is said to have been the first to practice circle plowing in Mississippi. The simple good sense of the innovation on the old and ruinous mode, at once recommended itself, and it became almost universal among all enterprizing and well informed planters through the South. But millions of acres had been well nigh ruined and thrown out to sedge grass and the foxes, before the improved mode was brought into practice. In that part of Mississippi where it was first adopted, the plowmen have acquired great skill and a practiced eye, so that, give a man a good two-horse plow, and he will engage to run it in such a way that in the softest soil, spread over an irregular group of steep hills, hardly a ton of mould shall be washed into the bottoms during the most rainy season.

Probably the best way to begin this system is in con-

nection with a series of circle ditches. These are laid out and made in the following manner.

Determine by experiments, or observe from the character and extent of the wash in a circular furrow, the fall that must be given a ditch in order that the soil at the bottom of it may not wash in gullies during a hard rain. In many lands this fall must not exceed an inch in ten feet, or one foot in a hundred. Commence now at the foot of the hill, at the point where it is desirable to have the waters of the hill-side discharged, and with a surveyor's level ascertain the point which is three hundred feet distant and three feet higher than the feet of the observer. Mark these points by stakes, marked No. 1 and 2, and thus proceed from stake No. 2 to stake No. 3, until several hundred feet are laid off. The curves and irregularities of the hill-side may not permit you to take observations of three hundred feet; in that case make the observations shorter and the stakes more numerous, but keeping the slope the same. Now run a furrow with a double plow from the first stake to the second, and so on over all the ground surveyed. Throw off two or three more furrows in the same way, and then let hands with hoes and shovels haul all the loose earth into one ridge. The spring of the year is the proper time for doing this, after the heaviest of the early rains. Then, when bedding up for a crop, be careful not to disturb these ridges. Their bottoms should be dressed off smooth and level, and the ridge trodden quite firm. In working the crop, pay some attention to these ditches, keeping the bed smooth, and filling up any little washes that occur, but being careful not to break the surface of the ridges or banks. If they soon become covered with grass, weeds, and scrub pines, it will be all the better. These ditches will take the water as it comes pouring down the hill in a violent rain, and convey it away down a slope so gentle that no washing can take place.

In cultivating the land that has been thus prepared, let the plowing correspond in direction and slope to these ditches. In this manner, all the middles between the beds will have the same fall, that is, one foot in a hundred; and, except in very long and violent storms, no water will pass over from one ridge to the other, that is, no wash will ever cross the ridges or beds. But when the rain is very copious, the circle ditches are at hand with a firm, sodded bank, to arrest the destructive torrent and confine the waters to their prescribed courses.

In this manner, all the fertilizing properties of the soil may be retained in it, and directed to the growth of useful plants; whereas, if washing is freely permitted, the hill-side becomes nothing but a series of sluices for carrying off some of the best constituents of the mould or earth above.

The above rule of one foot in a hundred is not given as a specific. In some localities it will do; on other soils it is too steep. Judgment and experience only will give the true grade. The plan above recommended differs but little from that described by Mr. Forman in his paper, published in the Patent Office Reports for 1852.

Mr. Forman recommends changing the grade of the circle ditch every fifty yards, making it steeper and steeper as the bottom of the hill is reached.

Unless the nature of the soil changes materially, I do not see the propriety of Mr. Forman's suggestion. If a fall of one inch in twelve feet is proper near the top of the hill, why is not that the best grade on the middle and near the bottom of the slope?

He proposes a fall of one inch in twelve feet for the first fifty yards, counting from the summit; two inches in twelve feet for the next fifty yards; four in twelve feet for the next fifty, and so on to the bottom.

For most hill lands, in the cotton States, a grade of one inch in ten feet for the entire distance will be found better.

As a cheap yet effective tool for laying off this grade, the following is given. It is Mr. Forman's, with one or two modifications.

Select a piece of ash or oak, just ten feet long, one inch thick, and four inches wide. Mortice it into a leg or support of pine, three feet long, and two inches square.

Make another leg three feet and one inch long, and cut the mortice several inches long, so that the bar or lath can be moved up or down so as to vary the length of the fore leg, as compared with the hind leg, two or three inches.

This may be omitted entirely if cheapness is an object and the bar fastened by screws, which can be drawn so as to make any necessary variation. If put together so that each leg shall be of the same length, the variation can easily be made by screwing a block of an inch or more in thickness on the foot of the front leg.

To complete this instrument and fit it for use, it will be necessary to fasten on it a small spirit-level; this can be screwed upon the side of the bar near one end, or on the top of it. Probably a long slender phial, nearly filled with some colored fluid and fastened to the top of the bar, would give a sufficient degree of accuracy. Now having determined upon the slope of the ditch, arrange the length of the legs accordingly. Your assistant stands at the point where you wish the water to be discharged, that is, at the bottom of the hill, and he has the hind leg. He carries a handful of pins in his hand. The operator at the front leg moves that end either up or down the slope, until the bar is level. Mark the beginning point with a pin, and move on, setting the hind leg in the track just made by the fore leg, and sticking a pin. The path thus indicated by the row of pins is the line of the hill-side ditch. It should go three or four inches into the subsoil, and care should be exercised so as not to have short turns, as their effect is to throw the descending water against the embankment.

After a violent shower or a long washing rain, it will be necessary to walk through the ditches to stop the washes and throw out the bottoms with a hoe. In these visits the farmer will often see slight changes that can be made such as changing the grade at the turns.

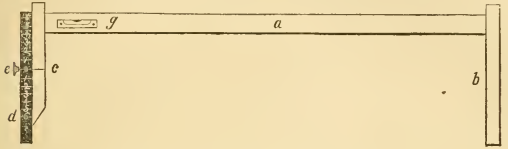

Fig. 19.—INSTRUMENT FOR GRADING.

a. Lath or bar 12 feet long, one inch thick, four inches wide, with *g*, a spirit-level screwed upon it.

b. Hind leg, 2 inches square, 3 feet long.

c. Front leg, 2 inches square, 2½ feet long.

d. Sliding leg, 2 inches square, 3 feet long, graduated and numbered from *o* up and down six inches each way.

e. Thumb-screw and bolt, by which the sliding leg is made fast at any required point; the mark *c*, on the front leg, corresponding to *o*, on the sliding leg.

The instrument of which the cut is given, is that described by Mr. Forman. One much cheaper than this, as above indicated, will answer all purposes.

In many cases the feet might be 15 or 20 feet apart. This would make the laying off much more rapid. Where the ground is not sodded, instead of using pins, the drawing of the hind leg along the line will make a sufficient mark to guide the eye of the plowman.

It will also be found practically convenient to let a plowman follow close upon the rear operator, guiding his horse by him. A day's practice will enable two persons to move rapidly enough with the level to keep a plow in steady motion behind them, and, after a good plowman has followed the level a few days, his eye will become so

educated that he can lay off ditches without any level, except on very irregular ground.

We come now to a consideration of the proper manures for the preservation and restoration of cotton lands, and the best manner of applying them. The harvesting of the product of an acre, for instance, planted in cotton, removes from the soil about sixteen hundred pounds of organic matter, of which four hundred pounds is in the form of cotton-wool, or lint, and the balance in cotton seed. No part or constituent of the wool is ever returned.

Let us now see what chemical substances are abstracted in taking away this wool. Suppose a hundred parts of cotton-wool be burned to an ash, and this ash subjected to chemical tests. What will appear to be its constituents? Thirty-one per cent., or nearly one-third, is potassa; seventeen, or less than a fifth, is lime; and twelve and a half per cent., or just one-eighth, is phosphoric acid; a little magnesia, and a little sulphuric acid are also found.

Thus, for every ten thousand pounds of cotton-wool, which might be expected to grow on twenty-five acres, sixty pounds of the above mentioned ingredients are withdrawn from the soil. That is, of phosphoric acid, twelve pounds; of lime, seventeen pounds; and of potassa, thirty-one pounds. Suppose this process to be repeated for twenty years upon the same twenty-five acres. There will have been withdrawn from the soil during that period two hundred and forty pounds of phosphoric acid, three hundred and fifty pounds of lime, and six hundred and twenty pounds of potassa. Such is the rate at which the wool or staple alone of the cotton exhausts the soil. The consumption is, certainly, very moderate. If a little more than half a ton of these chemical substances were incorporated with the soil every twenty years, or what would be better, sixty pounds a year, the twenty-five acre field would not decrease in fertility.

Suppose now that the cotton seed as well as the wool is

not returned to the soil. The composition of the ash of cotton seed has been found to be as follows: sixty-two per cent., or nearly two-thirds, is phosphate of lime; thirty-two per cent., or nearly one-third, is phosphate of potassa; the balance is made up of a little sulphate of potassa, a little silica, with slight traces of the carbonates of lime, magnesia, and potassa.

Thus it appears that, as a dressing or fertilizer for cotton lands, no substance is superior to cotton seed, and when this is used as fully as possible, that is, when all the seed of a crop is returned to the soil as manure, except what is necessary to germinate the crop of the following year, the consumption of chemical constituents in the soil is very slow, being at the rate of sixty pounds for twenty-five acres, or a little over two pounds to the acre. Of the three mineral ingredients abstracted by the cotton-wool, two are easily replaced, the potash and the lime. Common wood ashes, and plaster, or slaked lime, or bones burned or crushed, will easily supply this demand. The requirement for phosphoric acid is not so easily met. The demand for it is moderate and the consumption slow, being at the rate of only half a pound to the acre, but the necessity for this element, in order to produce a healthy plant, is imperative; and in all soils that are not alluvial, that is, where there is not a great abundance of fine vegetable mould, the demand for phosphorus is probably the reason why diseases of various sorts, such as the rust and the rot, attack the plant.

In addition to lime and ashes, some fertilizer containing the phosphates must be used. Compost, or barn-yard manure, and bone manure, will supply this element. Weeds abounding in the alkalies furnish profitable vegetable matter for making a good compost. Muck or peat, which is decayed vegetable matter in mass, contains a large amount of the phosphates and the alkalies.

To give a summary then, of the best manure for cotton

lands, we may say: Make a compost heap by hauling muck to the barn-yard, and allowing hogs to root it over and wallow upon it. The droppings of barn-yard fowls should be added as being particularly rich in the phosphates. Some lime and ashes may profitably be sprinkled from time to time upon the pile. When this compost manure is rich in all these elements, it should be applied liberally, and in connection with it, the mode of plowing and ditching above described should be employed so as to retain upon the soil all the fertilizing salts. If twenty-five acres of land, which is naturally good cotton land, is dressed with, say, a cord to the acre of compost manure such as is described, there is no reason in the nature of things why it should not, for ten years at least, and probably for twenty, continue to produce a bale to the acre.

Of the condensed fertilizers it is probable that guano, the most powerful of all the manures, being the ordure of sea birds and containing a large amount of bone earth, and being also particularly rich in the phosphates, is the best. Next to guano may be mentioned crushed bones, or bone ashes; and it may be well in this connection to give Liebig's rule for the preparation of bone manure.

"Pour over the crushed bones or bone ashes half their weight of sulphuric acid, diluted with four parts of water. Add one hundred parts of water, after the former mixture has been digested for twenty-four hours. Sprinkle this mixture over the field immediately before plowing. By this action, in a few seconds, the free acids unite with the bases contained in the earth. A neutral salt is formed in a very fine state of division, that is very uniformly and evenly dispersed through the soil."

By this manner of applying manure, it is rendered so fine and so thoroughly mixed with the soil that the roots of the plants find it in every direction.

The practice of manuring in the drill, or in the hill, which is successful with corn, does not answer at all with

cotton. Throw a shovelful of strong stable manure into a shallow pit and cover it with an inch of earth, and you have a bed on which Indian corn will be almost certain to sprout, and where, in a favorable season, it will grow vigorously.

If a dozen or more cotton seeds were dropped on a precisely similar bed, the probabilities are that not a single one would ever germinate or produce a healthy plant. They would all rot. The reason of this was very carefully investigated some years since by Dr. Cloud, a cotton planter in Alabama, one of the most intelligent, as well as industrious, agriculturists that ever gave thorough and patient investigation to all the details and reasons of successful cotton growing.

Dr. Cloud at first manured generously in the hill, allowing half a gallon of compost to each plant. The cotton grew finely after it came up, but he could get no stand by this method. He found, after experimenting and careful investigation, that the unnatural warmth and dryness produced by a mass of strong manure, is fatal to the germination of cotton seed. "The cotton seed," says he, "in the process of germination, attracts from the surrounding soil and from the atmosphere an unusual amount of water as compared with other seed undergoing this process. Any artificial condition of the soil which concentrates immediately about the cotton seed at this time an undue quantity of alkaline, gaseous matter, causes the fluid contained in the tender, reticulated or mesh-like, incipient, vegetable fibre, to undergo a species of fermentation which, of course, destroys the vitality of the young plant. Cotton is subject to this influence where a quantity of good manure, either compost, guano, or chemical fertilizers have been used in the hill.

"The tap-root of the cotton plant does not make its way into the soil a perfectly organized root; the radix or tap, leaving the seed at the small end, plunges directly

downward, and commences pouring out a semi-fluid substance which passes downward, partly by the force of gravity.

"This substance is remarkably delicate and fragile, easily broken up and disturbed by any foreign or unkindly presence. It is the mould in which the tap-root is formed. Thus it is easy to understand that an unnatural alkalization, or the warmth and ferment produced by fresh and strong manure in the close vicinity of a vegetable process so delicate, should affect and generally destroy its vitality."

After making this discovery, Dr. Cloud, by no means ceased the use of compost manures on his cotton. He spread it on broadcast and plowed it in.

He communicated the results of his various experiments and discoveries to the Albany Cultivator, and the following condensed instructions on scientific cotton culture may be taken as a summary of Dr. Cloud's method, with various additions and suggestions derived from the experience of the author of this Treatise.

"High farming," when cotton is the chief crop, does not consist in drawing large crops from virgin or from alluvial mould, returning nothing and exhausting any soil that is not, like the alluvions of the Mississippi or the Nile, strictly inexhaustible. The truly successful cotton planter is not the man who manages, year by year, to take a thousand bales from a thousand acres of Mississippi bottom or the black cane lands of middle Alabama. The really admirable manager is one who takes average land, the natural growth of which is pine or forky-leaf black oak, or small white oak, keeps it in as good condition as he found it, or even better, raises his own meats, vegetables and wool, and one year with another takes as much cotton from an acre as his neighbors, working in the old way, take from three!

By what system of agriculture, now, can these results be obtained?

First of all, let the planter who aspires to brilliant success in his profession prepare his lands so as to prevent washing, and retain in the soil all the fertilizing salts he finds there, and all he may add by generous manuring. The precise methods by which this is done are given in detail in the first pages of this chapter.

Now let him arrange for a rotation of crops as follows. Divide the plowed land into three parts or tracts, not by fences, but "in your mind's eye, Horatio," assigning for each farm laborer five acres in cotton, ten in corn, rye, wheat, oats, barley and potatoes, according to soil and climate, and allowing five to remain fallow. Calculate to have on the farm stock enough to consume all the food that grows on those ten acres per hand, mules, horses, oxen, cows, sheep, goats and poultry, and lay it down as a first principle that no manure is to be wasted. For that purpose provide a series of stock pens on the most level land that the place affords, fence them high, and throw up a little bank at the fence, so the tendency of the wash will be towards the centre. Here erect a shed on four posts, the ends that enter the ground being charred. Let the shed be about twenty feet square and hip-roofed.

Let every animal on the place be confined at night in these enclosures, or in stables, and provide an abundance of litter. Leaves from the forest, and particularly pine straw, is better even than wheat or oat straw, as it is shorter and contains more potash. Moisture is needed in order to rot any litter you may use. Yet, if the manure heap is too wet, you carry an unnecessary amount of water into the field. Hence the best plan is, to scrape the cattle yards on wet days, piling the compost under the sheds, there to ferment and decay. As soon as a yard is scraped down, cover with fresh litter from the forest; this also can be more conveniently gathered on wet days, or immediately after a rain, while it is yet too moist for plowing. When the successive layers are thus collected

under the shed, other and more concentrated fertilizers may be added. If your soil is deficient in lime, sprinkle, say a bushel, every time the yard is scraped. Wood ashes never come amiss on any soil. Sprinkle over the compost heaps all the ashes the place affords, never allowing a shovelful to be thrown away or to become leached by the rain. Obtain a few pounds of sulphuric acid, and after it has eaten up all the bones and decayed animal matter on the place, sprinkle it upon the compost beds. The decayed leaves and the ashes will afford the potash your crops want; the bones and the ordure will yield the phosphoric acid and the lime.

In this manner, when March comes, there will be five hundred bushels of compost manure for every acre of cotton. The land upon which it is to be spread was fallow the year before, and thus the cocoons of the Boll-worm are all dead. Mark off the field by a scooter plow (unless the old rows are visible) into lines; the first, fifteen feet from the fence, and the others, thirty feet apart. On these lines or rows deposit the manure, in heaps of ten bushels each. This is easily done by having the capacity of the cart twenty bushels, and hoeing out half at the first heap and dumping the rest of the load for the second. In this way the manure is evenly distributed at the rate of ten bushels to nine hundred square feet, which is within a small fraction of five hundred bushels per acre. With compost manure, made up as described, and especially that to which ashes, lime, dissolved bones or guano has been added, this allowance is heavy manuring and very thrifty plants may be expected. Accordingly, the rows should be laid off wide; five feet is none too wide. Mark the beds by running a plow at this interval that will make a deep, narrow, furrow. Now spread the compost, throwing some, but not a great deal, into this furrow, and let the turn or mould-board plow follow, casting two furrows toward and into this first trench, and continue running un-

til all the middles are broken out and the manure well covered in.

This should be done a month before planting time; then from the first to the tenth of April, if the season is sufficiently warm and dry, harrow the beds and mark not only the line of the rows, making them perfectly uniform and straight, but by cross plowing lay off the distance of the plants from each other in the drill.

Probably with this high manuring, thirty or thirty-six inches ought to be allowed. Plant by dropping three or four seeds in the drill at the point indicated by the marker. The best way of preparing seeds is to roll them in a mixture of lime and ashes, with which a little guano has been mixed, having soaked them previously in stable manure, to which salt and water have been added. Treated thus, germination will be almost certain and prompt. As soon as the third leaf appears, go over the crop with the hoe, for, with the thorough plowing and harrowing, very little grass will have made its appearance in ten days.

Select the thriftiest plant and destroy all the others, thus thinning out to a stand at once, and leaving the fields perfectly clean. In this way, all the vigor of the soil, and the dressing which has been thus generously applied, is concentrated upon the plants, and they may be expected to thrive and grow very rapidly.

The cultivation can be done almost entirely with the plow and scraper after the second hoeing. Twice, at least, before the plants attain their growth, the scraper may be run each way; and as there is entire uniformity throughout the field, the rows being exactly five feet apart, and the plants in the row precisely three feet asunder, there will be no difficulty in running the wing of the scraper within two inches of the plant on all sides.

After the first of June the limbs of the plants in the rows will commence to interlock, so that the plows can be run only between the beds, that is, in the five foot inter-

val. Here the plowing may be continued through the greater part of July, as frequently as the condition of the crop requires it.

Now, what returns may be expected from a field thus manured, thus planted, and thus cultivated? Dr. Cloud tells us that in this way he made at least double crops and sometimes treble, that is, he took as much cotton from his five acres as his neighbors from their ten or fifteen acres, cultivated in the old style.

It will be observed that cotton seed is not recommended as a direct or immediate manure for the cotton plant. It has been found that cotton thrives better on the second year after a liberal application of cotton-seed manure than on the first. It seems that cotton seed is, at the first, too heating as a manure, creating as it does some fermentation in the drill. Afterward, when fermentation is ended, there is a tendency to an undue stimulation of the plant to the production of woody fibre. In other words, the plant that is strongly stimulated by cotton seed, tends to growth rather than productiveness. For this reason, it is found better to reserve that part of cotton seed intended for manures, and apply it as a direct and powerful fertilizer to the corn. In this manner a very fine crop is taken from the field the next year after the corn is harvested, and the force of the cotton seed and of the compost manuring of the previous year, become sensible in the third year in the crop of wheat, barley, oats, millet, peas, or potatoes, which are grown on the second year after the cotton. On the fourth year the land is permitted to rest and "enjoy its Sabbath."

By this system of rotation the cotton-louse, the rust, the dry rot, and the Boll-worm, are quite sure to be prevented, and the only risks which the planter takes in his cotton are the dangers from caterpillar, the Army-worm, or an early frost. By promptness and energy the two former may be successfully contended with, and the more

so as the cotton field is only half as large as that commonly put in cultivation by the same number of hands.

By following this method of thorough manuring and systematic rotation, the certainty that the planter may feel in his cotton crop is much greater, and the large amount of cereals and edibles which he raises, and the abundance of stock which he consequently keeps upon his place, render him much more independent of his merchant in case of a failure of the cotton crop; and he is also much more able to prescribe the time of selling, and the price, than if he had a heavy balance against him for pork, beef, flour, and clothes, already advanced by his factor. But the crowning advantage or recommendation of this system is, that his lands are all the time growing better. The fertilizing salts, incorporated with the soil in the five hundred bushels per acre of rich compost manure, followed by a liberal dressing of cotton seed the next year, are not exhausted by the three successive crops of cotton, corn, and cereals which are taken from the land. As the surface is so ditched and plowed that the fertilizing properties added in the manures are all retained, it opens richer on the fourth year after enjoying its rest of one year, than it did at the commencement of the former series, so that in sixteen or twenty years of this "high farming," which is nothing more than true farming, the cotton grower may confidently expect to see his plants standing six and eight feet high, the branches interlocking on both sides, each plant loaded with bolls, and the field yielding considerably over two bales to the acre; while within rifle shot he may see the lands of his neighbors covered with little stunted plants twenty inches high, admitting of free passage along rows that are four feet wide, suffering every year from some of the diseases that befall, or the enemies that attack the plant, so that the average yield, one year with another, will not be much over half a bale to the acre.

This almost incredible difference is wholly due to a

strict adherence to what should be regarded as a cardinal principle in all farming operations. That is, *always to return to the soil more fertilizing properties in the form of manure than are removed in the crops; and to cultivate every crop with such thoroughness that the entire productive energy of the soil and its constituents will be conserved and concentrated upon the plant in cultivation.*

Another advantage which the cotton grower will reap by this system of generous manuring, and particularly by the use of fertilizers which are rich in phosphates, is the improvement of his seed, and consequently an increase in the length and fineness of his staple; for an excellent quality and an abundant yield of cotton-wool can no more be expected from seeds which are dwarfish, than large clips of wool can be taken from small, half-starved sheep. The improved varieties of cotton seed which are introduced from time to time, and whose merits are loudly vaunted, are nothing more than the product of common varieties, grown in a favorable season, on fertile soil, and in the best part of the cotton zone.

Improve the cotton seed, and your staple is directly augmented in value. It is on this account that guano has been found an excellent fertilizer for cotton. It does not stimulate the growth of a plant so rapidly as some other manures, but it tends directly to perfect the seed and the staple. It can be used to great profit. Ten dollars worth of it, or three hundred pounds per acre, properly applied to land that, without it, might produce a thousand pounds of cotton, will double the crop, due allowance being made for the casualties and vicissitudes affecting the cotton plant, as guano is no specific against any of its ills, except the lice and sore-shin.

It should be remarked that guano as well as compost manure ought to be applied early in the season, and well blended with the soil by the plow and harrow. It is a sort of medicine to the soil, so to speak, and its immediate

effects should have time to pass away before the seeds are presented for germination. As guano is particularly rich in phosphate, it is well to use it in combination with a fertilizer that supplies some other principal constituent of the plant, as, for instance, lime. Hence, it is recommended to mix a bushel of guano with half a bushel of plaster of Paris, or sulphate of lime, and apply it at the time of the first plowing, when the beds are thrown up. The effect of one will be to stimulate the fibrous growth of the plant and give it size; of the other to increase its productiveness, by enlarging the size of the seeds, increasing their vigor, and thus producing a staple that is longer and more finely colored by the oil that is drawn from the seed.

CHAPTER IV.

THE VARIOUS KINDS OF COTTON CULTIVATED IN THE UNITED STATES.

There are two leading varieties of cotton cultivated in the United States, the black seed and the green seed. The black seed is botanically known as the tree cotton, or *Gossypium arboreum*, and came from India. The green seed, or bearded cotton, is of Mexican or West India origin. The nankin or yellow differs from the Mexican mostly in the color of its staple, it being of a pale yellow hue. Peruvian cotton has been introduced and cultivated to some extent; it has black seeds which cling firmly together, while the seeds of the Sea Island are separate and easily parted from the wool.

The cultivation of the Sea Island is local, and the amount produced in this country, as compared with the

Upland or Green Seed, is as one to one hundred. As the soil, climate, and mode of ginning of the Sea Island are all different from the Upland, some account will be given at the close of this chapter.

The Mexican seed was introduced from that country about the beginning of the present century. The story is that our Consul at the City of Mexico, noticing the superior quality of the staple grown in that country, asked permission of that Government to bring home a quantity of the seed. His request was refused; but afterwards, when dining with one of the Ministers, he was told that he could not take cotton seed out of the country, but the Mexican Government would make no objection to his exporting as many *dolls* as he might wish to. The Consul took the hint, and ordered several hundred dolls to be stuffed with choice cotton seed. Thus the famous "Mexican seed," known from James River to the Rio Grande, became domesticated in the United States. Its peculiarity seems to be its adaptation to a dry, uniform climate. The wool or staple is white, with a faint tinge of yellow, after it has laid for some time in the seed. In a dry season, when the supplies of moisture have been moderate, and in small quantities at a time, the staple of the Mexican is long, even and soft; the bolls open wide, and the weight of the seeds pulls the wool out, and causes it to hang in a long silken tuft or handful, which, if not picked for some time after opening, is liable to become soiled with mud and sand, or, after frost, filled with fragments from the leaves and pods.

A number of planters in the southern part of Mississippi, near where Rodney now stands, were among the first, if not the very first, to pay attention to the improvement of cotton seed. They produced an excellent quality, which was much in demand in all parts of the South. Their bags were marked "Petit Gulf," the name of a small shipping point on the river where an eddy in the

stream made a little bay or gulf. From this circumstance the seed was universally known as "Petit Gulf," or Gulf Seed, and under that name has been so extensively used in all parts of the South, except the Sea Islands, that it may be regarded as *the* seed from which the "American Upland" of commerce has been produced. Beginning with the year 1820, and from that time forward, various planters in different parts of the cotton growing States have devoted themselves to the development and sale of improved varieties of cotton seed, and certain styles of cotton have for two, three, or four years, enjoyed a great, though ephemeral popularity, and then, as suddenly, been pushed aside for a new reigning favorite.

The improvement of cotton seed as a business, and the sale of the improved varieties, has enabled quite a number of prominent and enterprising planters throughout the South to realize handsome fortunes. It is probable that, as a manure, cotton seed is seldom worth more than twenty-five cents a bushel, or, at least, twenty-five cents judiciously expended in making good compost or barn-yard manure will produce as much fertilizing power as can be obtained from a bushel of cotton seed. But a good quality of Petit Gulf, or Mexican, commands at least fifty cents, and the choice varieties, such as the "Sugar Loaf," the "Brown," the "Hundred Seed," and many others that could be named, such as the "Banana," the "Multibolus," the "Prolific," under ordinary circumstances, command from one to three dollars per bushel. A bushel of cotton seed weighs from twenty-five to thirty pounds. An acre produces, of the cotton wool, say four hundred pounds, and of the seed fourteen hundred pounds. Thus, for manure, the product of an acre in cotton seed is worth eleven dollars.

It is practicable for every cotton grower by selection, improvement, and judicious cultivation, to produce an improved seed. Now, how is this to be done?

In general, it may be said, that cotton seed, like corn, potatoes, or wheat, is improved by cultivating the plant in the best manner, under the most favorable circumstances, and then selecting from each stalk those bolls which are the largest, the finest, and the most perfectly matured. The seeds from these bolls are, after ginning, to be again picked over, all that are blasted or imperfectly shaped, rejected, and the remainder carefully tended, so as not to become fermented, or in any manner damaged before planting time of the following year.

Probably as much depends upon locality as upon any other circumstance with respect to the improvement of cotton seed. Choice varieties never come from the rank, moist lands of the Mississippi Valley, near Natchez; neither does the neighborhood of Memphis afford superior seed. The first improvements in cotton seed in this country were made, as above stated, by painstaking with the original Mexican seed, on the part of a few planters living on the Mississippi River, not far below Vicksburg. The immediate vicinity of Vicksburg has also been remarkable for yielding superior varieties. Colonel Vick, of that city, a descendant of the man from whom the place is named, has been the most persevering and the most successful of all the Mississippi planters in the art of perfecting cotton.

Another very successful and somewhat more noted agriculturist, remarkable for the great variety as well as the excellence of his seed, is Mr. M. W. Phillips, of Edwards, Mississippi, a small town in Hinds County, a few miles north of the capital of the State. In 1848, Mr. Phillips wrote: "The seed most relied on in Mississippi and Louisiana is Mexican seed, known in Carolina and Georgia as 'Petit Gulf' seed, because there first planted and improved, on the hills around Rodney, Mississippi, where the improvement began; but there is just as good seed, at present, elsewhere, as in that vicinity. We plant 'Sugar-loaf,' or 'Prolific,' 'Lewis' Prolific,' 'Vicks' Hun-

dred Seed,' 'Guatemala,' 'Brown Seed,' and others. Except the 'Guatemala,' they are all, I believe, mere selections from the Mexican."

Probably the most noted and, on many accounts, the best varieties or developments from the original "Petit Gulf," are the "Prolific" and the "Sugar-loaf" seeds. A planter in Hinds County, writing upon the characteristics of the latter variety in 1848, says: "This day, being called into my field south of my pasture, where I have my selected 'Sugar-loaf' seed planted, I was so forcibly struck with the prospect, that I conceive it my duty to draw attention thereto. I saw, repeatedly, limbs with six, eight, ten and twelve bolls and forms, which were not that many inches long; I could span so as to reach ten without any exertion. I have forty acres planted with Sugar-loaf seed, and think, I can reasonably calculate on fifty bales, and I do not know of any other forty acres of Petit Gulf seed, in this region, which promises forty bales. My seeds have been planted remote from others for these two years; they were selected from the field by myself, assisted by a very careful laborer; yet I find a great tendency in this seed, as in all the improved varieties, to run back, which can only be guarded against by careful, yearly selection."

The same agriculturist, writing seven years later, in 1855, gives the following summary with regard to the improved cotton seed in that vicinity. "We will plant as nearly an entire crop, as we have good seed, with the 'Cluster' cotton seed. This is the original name, but known now by as many different styles as there are persons who desire to make money by selling seed. We expect to plant 'Silk,' 'Hundred Seed,' 'Sugar-loaf,' 'Draw,' and small parcels of others. The 'Cluster,' or 'Banana,' has been much improved. The best now on sale is 'Boyd's Prolific'; from this I have culled very carefully for three years. Many who have seen this selection deem

it better than the original accidental variety; for I learn from Mr. Boyd that the 'Prolific' seed, which has become so noted, originated from an accidental stalk which he found among his cotton, which he considered very remarkable for the number of bolls it contained. He carefully preserved all the seed of this extraordinary specimen, and very properly names it the 'Prolific.' 'Silk' is perhaps better for all descriptions of land; many of my friends prefer it to 'Banana,' objecting to the latter for poor lands, and also for rich fresh land. On the first the forms dry up, and on the latter the stalk becomes so rank, that it breaks down. This latter defect can be remedied by topping. 'Sugar-loaf' is best upon new ground, where the soil is rich and the growth sweet gum. I have made a bale and a quarter to the acre the first year the land was cleared. The 'Hundred Seed' still retains its popularity, as suitable for rich, fresh land."

As an instance of the manner in which many somewhat celebrated varieties have originated, the following circumstance is subjoined. In 1847, Colonel H. W. Vick, who had been for fifteen or twenty years selecting and improving his seed, made up eight small parcels of cotton in the seed, and sent them to Mr. Phillips, requesting his examination and the results of his experimenting. One of these packages was marked "Belle Creole," not known at all as a distinct variety, but resembling the "Silk." Mr. Phillips planted these eight varieties in the spring, cultivated and picked them with his own hands, taking special care in the selection of the finest bolls on each plant. From the growth of the seventh package he selected a small number of the finest bolls, and sent some to Governor Hammond, of South Carolina, and another package to J. V. Jones, a planter in Georgia, who was quite well known as an agricultural writer under the signature of "Jethro." Out of compliment to Mr. Jones this was called the "Jethro" seed, and is regarded as a

very choice variety, and was produced, as we learn, from Mr. Phillips, by Colonel Vick of Vicksburg, who selected year after year those plants which yielded the softest and the finest cotton, sent a package to a neighboring planter who cultivated the seed carefully, and sent a package of his seed to Georgia, where it attained celebrity for the fineness and softness of the staple.

Some of the varieties of cotton seed were wonderfully prized when first introduced, and commanded sums that seem almost fabulous. For instance, the "Banana," a seed that became famous about twenty years ago, at first sold for a hundred dollars a bushel. It was introduced by a planter in Warren County, Mississippi, near Vicksburg, and the production was supposed to exceed anything that had before been known. It was almost identical with the "Hogan" seed, and some paid ten cents apiece for "Hogan" seeds. Yet, for some reason, probably the deterioration natural to a careless selection of seed, it was not three years before "Banana" could have been bought for fifty cents a bushel. The same is true of the "Mastodon," which came in repute about the same time. Mr. Ably, a very sensible and ingenious planter, near Yazoo City, and Mr. D. F. Miller, of Concordia Parish, Louisiana, took prizes on "Mastodon" cotton; and as the lint in this variety clings to the seed a little more firmly than the others, an improvement, or a modification rather, of the ordinary gin, was made to suit it. And yet, a few years after, a writer in the Cultivator, from Cayuga, Mississippi, speaks as follows of this famous variety:

"If you recollect, the 'Mastodon' was introduced some four or five years since, and I remember when there was not sufficient seed in the neighborhood to supply the demand at five dollars per bushel. I am acquainted with the gentleman who first planted and sold the seed in this State, and it is generally believed that his profit was much greater from the sale of the 'Mastodon' seed, than the

proceeds of his entire crop for two years; but at this time there is not a seed of it growing, to my knowledge."

Some varieties, as the "Brown" and the "Multiboll," and the "Okra," under favorable circumstances, produce a plant that is very prolific in bolls, sometimes throwing out twice as many as a common seed. But an objection is very properly made to them, that the cotton hangs loosely from the open boll, so that, if a stormy day occurs in the latter part of October, or early in November, when the fields are the whitest, a large part of the open cotton is blown out and wasted. This is probably more than an offset to the greater facility of picking.

As a summary of the whole matter of varieties in cotton seed, a careful perusal of nearly every thing that has been written upon the subject, together with the verbal testimony of a large number of excellent planters, has brought me to the following conclusions:

I.—Every cotton grower, who cultivates a good cotton soil in the best part of the cotton belt, (the region between thirty-two and thirty-three north latitude,) can, in a few years, produce a choice variety of cotton seed by taking pains with any of the ordinary seed.

II.—This improvement is brought about by carefully selecting the best bolls that open before frost, regard being had sometimes to the number of bolls upon the plant, and sometimes to the fineness and softness of the staple. By selecting the former, he may produce a seed famous for its productiveness. By taking the latter, the variety may have a high repute for the superior quality of the lint. After ginning, the seed is sorted over, and well cared for until the planting time of another year.

III.—All these improved varieties are quite certain to "play out" in a few years, unless the same pains are taken to sustain the character of the seed that were used to produce it. In other words, no variety will remain superior unless the seed cotton is selected with care.

IV.—It always pays to be particular in collecting and caring for the seed cotton of a place. The practical difference between good seed and bad, is this: By having seed that produces a superior quality of cotton, the planter may obtain from one to five cents more a pound for his crop. By planting seeds remarkable for the largeness of their yield, he may realize an increase of from one hundred to three hundred pounds more of ginned cotton to the acre.

V.—An enterprising, and pains-taking cotton grower, by developing a superior quality of seed, and securing for it a reputation, may make as much from the sale of his seed, as he does from that of his ginned cotton,—it being understood, of course, that he is surrounded by planters who, being careless with respect to their own seed cotton, are always desirous to obtain improved varieties.

SEA ISLAND COTTON.

Edisto Island, south of Charleston, is the most favorable part of the United States, in respect to both soil and climate, for the production of "Sea Island Cotton." It has a sandy soil, but little above tide, which, penetrating the island through numerous small channels, gives irregular shape to the plantations, but permits boats to come to almost every man's door. The mud from salt marshes is much used as manure, and is differently applied, according to the taste and judgment of various planters. As the soil is generally very light, it is unproductive, unless manure is used; and even with manure the average yield of Sea Island cotton is not much more than half the average of Upland cotton. A sea-board planter, writing from Liberty County, Georgia, in 1848, says that in eighteen years his crops have averaged a fraction over three acres per hand, the yield one hundred and thirty-seven pounds per acre, and the net proceeds per hand, eighty-

three dollars. During that period, the highest average price paid was thirty-seven and a half cents per pound; the lowest, fourteen cents.

The Sea Island cotton is the product of a plant that seems to have been first carried to the Bahama Islands from the Island of Anguilla, whither it is believed to have been transported from Persia, and was introduced and cultivated upon the islands along the coast of Georgia, immediately after the close of the Revolutionary War. The staple or filament of Sea Island cotton is exceedingly long, silken, and delicate. To pay as well as the short staple, or Upland cotton, the Sea Island must sell for twice as much per pound. Since the year 1850, the price has greatly advanced, so that Sea Island has, much of the time, commanded three and four times as much per pound as the ordinary staple.

About ten years ago, samples of Sea Island cotton, grown on Edisto Island, together with a number of specimens of the soil, were taken to Baltimore, and carefully examined and analyzed by the State chemist. The analysis of the seed and wool gave results very similar to the analysis of Upland cotton, given in the first part of Chapter Third.

It may be well, however, to subjoin a few of the results obtained by the Baltimore analysis. Taking two hundred pounds as the average growth of Sea Island cotton upon an acre, and adding the six hundred pounds removed in seed, it was found that, reducing these eight hundred pounds to ashes, and ascertaining the composition of the ash, an ordinary crop removes each year from an acre a little more than twenty-six and a half pounds of chemical salts, of which a little more than nine pounds, or about one-third, is potash, nearly nine pounds is phosphoric acid, of sulphuric acid a little more than a pound, three and a half of magnesia, and of lime nearly two pounds. The principal difference between this and Upland cotton is in

a substitution of magnesia for lime. The amount of potash is very nearly the same in both varieties. The Sea Island has a little more phosphoric acid than the other, and less lime. The soil upon which the two hundred pounds of cotton, thus analyzed, was raised, was found to be composed, as to its bulk, of nine-tenths of fine alluvial sand, and one-tenth of a cement, consisting of sand, peroxide of iron, clay, lime, magnesia, and humus.

An examination of the cement, or that part of the soil which is not entirely sand, shows that it is composed very largely of a combination of sand and peroxide of iron, a considerable amount of magnesia, and a small quantity of lime. On account of the deficiency of lime, the cotton plants are led to appropriate more abundantly magnesia, a substance which, in its chemical character and properties, much resembles lime, and which, therefore, is capable of taking its place to some extent.

As to the directly nourishing properties of the soil, the analysis shows, that in the three thousand tons which constitute the surface for the depth of one foot over an acre, there is less than fifteen pounds of phosphoric acid. As one two-hundred pound crop consumes nearly nine pounds of phosphoric acid, it follows that, with no manure, the second crop, planted on the same soil, would find a little more than half enough phosphorus for its proper growth.

In the same soil, there was found less than twenty pounds of potash, so that, as a two-hundred pound crop consumes over nine pounds of this chemical salt, the third successive crop, without manure, would find little or no potash to feed upon. The result of this chemical examination of the Sea Island soil is, that it must be kept up by the use of manures rich in the phosphates, rich in potash, and having a considerable amount of sulphuric acid. A dressing, composed of rotten cotton seed, mixed with the ordure of domestic animals, if used in sufficient quantities,

would meet this deficiency; and of manures, not directly the product of the soil, the best are Peruvian guano, bone dust, dissolved in sulphuric acid, and the various refuse of manufactories, rich in potash.

The Sea Island cotton is planted from March twentieth to April tenth, upon high beds, five feet apart one way, by from eight to twenty-four inches the other, according to the richness of the soil. It is cultivated in very much the same manner as Upland, except that more reliance is placed upon the hoe and less upon the plow. Much more pains is taken in picking, ginning, and marketing the Sea Island cotton, than with the ordinary Upland. In gathering it from the field, great care is exercised to keep it free of trash and all stains. It is transferred at once to the drying scaffold, where it is sorted over before packing away in the cotton house. The ginning is done almost entirely in dry weather, when the cotton is again sunned and picked over; that which is picked late in the season, or after a rain, is run through the trasher, which whips the locks against pegs or bars, and frees them from sand and loose dirt.

It then goes to the gins, where the seeds are separated from the wool. It is somewhat remarkable that no practical improvement has yet been made upon the rude invention which was used for this purpose almost a century ago. Neither the Whitney gin, nor any of its modifications or improvements, are found to be effectual in separating the lint of Sea Island cotton from the seed, without cutting or tangling it. The form of this ginning instrument is extremely simple, consisting of nothing more than a treadle and a couple of small iron fly-wheels, for the purpose of producing the rapid and steady revolution of two wooden rollers, about a foot long, and about an inch in diameter. These rollers wear out very rapidly, and are renewed almost daily. It is probable that a pair of gutta

peroha rollers, of about the size of those used in clothes wringers, might be found effective and durable.

A Mr. L. S. Chichester has produced a machine which is said to be entirely successful in its operation on Sea Island cotton. The lint passes between two rollers, one fluted, made of polished steel, an inch and a quarter in diameter; the other of vulcanized rubber, twice as large, while a plate of iron, vibrating in front of the rollers, rips out the seeds as the cotton is drawn through. It is stated that it cleans three hundred pounds a day without crushing any of the seed.

The machine, in common use, is set in motion by the foot of the operator acting upon the treadle, and the cotton is fed between the rollers by hand, the lint passing through, and the seeds being retained. The operation is slow, as compared with the process of Whitney's gin. Thirty or forty pounds a day is the extent that can be ginned on one of these little machines, whereas a good eighty-saw Whitney gin will, in the same time, turn off thirty-two hundred pounds. No other satisfactory mode of propelling these gins has ever been discovered, though much money and ingenuity have been employed in the endeavor to apply horse and steam power to the operation of ginning Sea Island cotton.

From the gins the cotton passes to the mote-table, where a careful and experienced operative examines it minutely, picking out every little mote and stained lock. The operation can proceed as fast as two gins can supply the material. From the mote-table it goes through the hands of a general superintendent, and then to the packer.

This kind of cotton is seldom pressed in the ordinary square bale, the purchasers preferring that packed by hand. The operation of hand-packing, as it is called, is performed by sewing the open end of a strong bag over a hoop, and suspending it through a hole in the floor. The cotton is thrown into the bag, and the packer stands with

a wooden or iron pestle, and rams down each successive layer or parcel of lint as it comes from the gin-room. The bale of Sea Island cotton is fifty or a hundred pounds less than the Upland bale.

This staple is never manufactured into the coarser muslins, but is used for the most delicate fabrics, such as cotton cambric and jaconet. It is extensively used in the manufacture of the finest qualities of cotton thread, and it is also consumed in large quantities by silk manufacturers, the fine, soft, and glossy fibre rendering it an adulteration of the thread of the silk-worm difficult to be detected.

The seed of the Sea Island cotton, which came originally from the Bahama Islands, and was known as the Anguilla cotton, was first cultivated by Josiah Tatnall, and Nicholas Turnbull, on Skidaway Island, near Savannah, and subsequently on St. Simon's Island, at the mouth of the Altamaha, and on Jekyl Island.

The largest crop ever raised in this country was in 1827, when the amount produced was nearly fifty thousand bales. Of late years, that is, since 1850, the annual production has been about thirty thousand bales annually. The Sea Islands proper, Edisto, Saint Simon's, Jekyl, Skidaway, and others, that line the coast of South Carolina, Georgia, and Eastern Florida, produce the finest quality. When the average price of "long staple" is fifty cents per pound, the cotton from many plantations on these islands will command sixty and seventy cents a pound. That raised on the lower bottoms of the Santee is next in value, while the Florida cottons are generally a little inferior.

From 1830 to 1850, the average price of Sea Island was a little less than twenty-five cents a pound. Since 1850 its price has nearly doubled, the average for a number of years being forty-five, forty-eight, and fifty cents.

CHAPTER V.

HOW TO REALIZE THE MOST FROM A CROP; SUGGESTIONS AS TO THE UNION OF THE GROWING OF COTTON WITH ITS MANUFACTURE INTO YARNS AND FABRICS.

The most that can be expected, or rationally proposed for the South, in the present generation, is a manufacturing system by which she may be able to produce the greater part of the plainer and coarser fabrics necessary for her consumption. It *is* practicable for the cotton-growing communities to produce on the spot, and within sight of the fields where the staple grows, their own Lowells and Osnaburgs, their own Linseys, and enough coarse bagging-cloth to make neat and snug wrappings for that part of the crop which is exported.

Instead of the present system, where every planter who makes upwards of twenty bales considers it necessary to have a gin, gin-house, cotton-sheds, and packing screw of his own, let the planting communities unite in the erection and equipment of a large neighborhood factory, with arrangements and conveniences for manipulating the entire crop raised within, say, six miles of the spot of its production, and making the most of it in every sense of the word. By estimating the present and prospective density of the population, the amount of the coarser cotton fabrics demanded for the yearly consumption of the community can readily be estimated.

In many parts of the cotton States, a neighborhood, or community, living within about five miles of a common centre, produces, in a favorable year, five thousand bales of cotton. The number of persons of all ages and both sexes, in such a community, is about fifteen hundred. I speak now of a strictly agricultural township where cotton growing is the business, everything else being subordinate and auxiliary to this principal occupation. The average

of the number of bales ginned and pressed at each gin-house, is not over two hundred, and in a great many neighborhoods much less than that; and the average cost of these establishments for ginning and baling the crop may be put at five thousand dollars, many steam-gins costing twenty and thirty thousand, and, on the other hand, many old-fashioned gin-sheds and old style wooden screws not being worth more than five hundred dollars. But, taking five thousand as a reasonable average, there is, in such a community, a hundred and twenty-five thousand dollars laid out in appliances for ginning and baling.

Now, the plan here proposed is that, instead of having this hundred and twenty-five thousand dollars distributed over so large an area and invested in gins and the machinery that accompanies them, let the neighborhood unite in putting up a factory that will gin out this whole crop, bale up in a small compact manner, with excellent bagging and strong varnished hoops, over four-fifths of the crop raised, and which shall also have arrangements for spinning and weaving sixty thousand yards of Lowells, Osnaburgs, and strong muslins, annually, and twenty thousand yards of Linseys.

The number of spindles and looms necessary to produce these eighty thousand yards of cloth can easily be estimated, and procured without difficulty. The number should be no more than sufficient to produce this amount of cloth in the course of a year. If a larger number were put up, the building might need to be much stronger and higher than would otherwise be required, and there would be no certainty that the extra looms and spindles might not stand idle for a considerable part of the time.

The subjoined drawing is a ground plan of a cotton factory of this description, designed for the accommodation of a community that produces five thousand bales annually.

W W W W, represents a substantial wall, or fence, that surrounds the factory. It is two hundred feet each way. *H, H*, are gate-ways. The enclosures, marked *a, a, a*, are cotton-sheds, or cribs, of sizes varying according

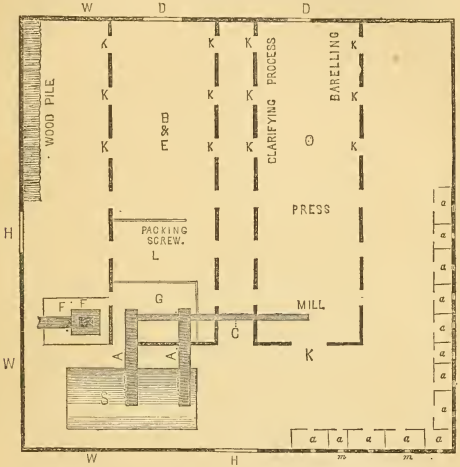

Fig. 20.—PLAN OF COTTON FACTORY AND INCLOSURE.

to the number of bales which the different planters in the vicinage commonly produce. These sheds, or cribs, are substantially covered, the roofs extending each way from the ridge-pole over the walls, which are open, of lattice work, for the free admission of air. The marks, *m m m m*, in the fence, or wall, are small openings, say 4 ft. × 4 ft., for the purpose of unloading the wagons without driving into the yard. *S* is a large, well built, scaffold, sloping toward the south, upon which the cotton, when taken from the sheds, is spread, to be thoroughly sunned before being ginned. *A* and *A* represent two endless aprons, or

feeders, which move slowly from the platform or scaffold to a receptacle above the gin-stands, from which the cotton is fed to the gins. *G* represents the ginning-room, where four or five gin-stands are placed side by side, propelled by an engine that is located directly underneath. *C* represents a small apron which conveys the cotton seed from beneath the gin-stands to *O*, an oil-mill, in immediate connection with the spinning, weaving, and ginning-mill, where are all the necessary appliances for extracting the oil from the seeds, pressing, clarifying, and barreling it. Immediately in the rear of *G*, the gin-room, is *L*, the lint-room, into which the cotton passes directly from the gins. Underneath the lint-room is a powerful press and packing-box, capable of compressing four hundred pounds of lint cotton into a space a little larger than twenty-seven cubic feet, or a cubic yard.

A press, capable of doing this, was patented in 1860, by P. G. Gardner, and is more fully described in the first part of this Treatise. It is twelve feet in hight, very strongly made, very hard to break or put out of order. It can be worked by hand, horse, or steam power, according as rapidity and economy of human strength is desired, and will compress four hundred pounds of cotton within the space of a cubic yard.

Of course, bales made in such a press and well bound with iron hoops would require no further compression at shipping ports, and might be carried from the remotest plantations to Boston, or to Liverpool, without losing half a pound in waste.

D and *D* are large double doors on rollers, at the rear, where the floor is on a level with the top of a wagon bed, so that the bales, or the manufactured cloths, can be loaded with the greatest ease at one door, and the barrels of cotton seed oil at the other. The openings, *K K K K*, are windows.

The first story or basement of the part marked *B* and

E, is occupied by the engine, which is under the gin-room, and by the packing screw; and the rear portion, with bales ready for market. *F F* are the boiler and smoke stack. Directly above it, the second story commences at the front with the ginning-room, back of which is the lint-room, and in the rear of that the carding and spinning-room. The third story is devoted to weaving, and also to the carding and spinning of a small amount of wool, sufficient to make twenty thousand yards of linsey-woolsey in the course of the year, enough to supply the neighborhood with all the plain woolen clothing they require. In the attic, or fourth story, there are arrangements for spinning and weaving into coarse bagging all the very much stained and inferior cotton which is brought to the factory.

With cotton at its present prices, (1867), considerably over twenty-five cents a pound, this would not be advisable; but eventually, when cotton falls, as it may, to about ten cents a pound, and the lowest grades to six and seven cents, it would be true policy for each neighborhood to make its own bagging. The article thus manufactured from the refuse and trash would be much closer and stronger than the ordinary Kentucky hemp bagging in use, and beside, the superior protection afforded to the bales would be valuable for various purposes after it had reached the end of its journey and been stripped from the package.

There is space in the gin-room for four large gins of eighty saws each, which, running steadily, would turn off forty bales per day, and thus the entire crop of the neighborhood or township, amounting to five thousand bales, could be ginned out, packed, hooped, riveted, and branded, between the first of September, when the gins begin to run on the new crop, and the first of January.

What now are the advantages of a system like the one here proposed? In the first place, the planter needs no

gin or gin-house, and only very cheap cotton-sheds for the temporary storing of a part of his crop, it being hauled and stored in his shed at the factory, of which he himself, if he chooses, can carry the key. In doing so large an amount of ginning, it would, of course, be expected that the machines would be of the best construction, and the operator, a person skilled in cotton and in machinery, so that the ginning would be done in the very best manner, the lint thoroughly removed from the seed, and not torn, or cut, or matted, or tangled by the improper action of the saws.

The appliances for packing and compression are also of the very best sort, the press being made principally of iron, and worked by steam power, making the bales very nearly, if not precisely, cubical in form, and varying not five pounds either way from four hundred each. They would be banded with substantial iron hoops, an inch or more wide, and prepared by being varnished, while hot, with coal tar. In the engine house, close by, is a blacksmith's forge, where the rivets are easily made and inserted while hot, battered down, or clenched in the most thorough manner. It would be expected also that the cotton would be sorted or graded while passing through the gin, which is, by far, the best time for doing it; and, as the planter's name or initials are branded upon the bale, the quality or grade could be put on at the same time. Honesty and thoroughness in this would soon work a most desirable change in the whole system of cotton marketing. There need be no sampling done, but the cotton ought to be sold according to the brand found upon it, so that the package would be entirely unbroken and undisturbed from the moment it was riveted in the gin-house, to the time the hoops are cut off in the distant cotton mill. The enormous and exorbitant charges which are made upon the crop at the various shipping ports, for drayage, storage, compression, re-packing, and insurances, would,

in this manner, be very much reduced, if not quite abolished.

After the principal part of the crop has been thus perfectly prepared for the market and shipped, it is proposed to throw the power of the engine for the remainder of the year upon the machinery in the second and third stories. During the months of January, February, March, and April, the spindles and looms are to be kept running upon the sixty thousand yards of Lowells and Osnaburgs, which are required for neighborhood consumption.

During the latter part of the summer, the machinery is employed in making up twenty thousand yards of Linseys, which are required for the winter wear of the population represented in such a factory; and, as before stated, the worst of the cotton, say fifty bales in all, could be, during the same time, spun and woven into bagging.

It is not to be supposed, that the above plan of having for every planting neighborhood, a ginning establishment capable of preparing nine-tenths of the crop for market in the most thorough manner, manufacturing the remaining tenth into all the cotton and linsey clothing required by such a community, and converting two-thirds of the seed into oil, will be found practicable, or even desirable, everywhere. In some regions, there would arise a difficulty as to fuel. In others, water power would be found cheapest, and in that case it might be best to enlarge the working capacity of the factory, and send many thousand yards of sheetings, muslins, and calicoes, annually to market. In others, the prime objection would be, that a good gin-house is now standing on every plantation, and there would be no economy in hauling the cotton in the seed five miles, when the facilities for ginning it at home are equally good. But with regard to those parts where the gin-houses have been destroyed in the late war, or where they are old and ill arranged; or in freshly opened

sections, where the better plan can be adopted at the first, some such arrangement is earnestly recommended.

The plan of acting by association in the ginning and manufacture of plain fabrics from the crop of each neighborhood, will be found especially suited to the small producer, the farmer, who, by his own labor and that of his children, plants and harvests ten or fifteen bales of cotton each year. It enables him to enter upon the business of cotton growing with as small an outlay as will enable him to engage in the cultivation of potatoes, or onions, or hops. He needs no gin or gin-house, nothing but a yoke of oxen with which to haul his seed cotton to the factory, where one bale will make cloth enough for his family for a year, and the balance will be ginned, classed, packed, pressed and covered, hooped and branded, with as much care and thoroughness as the five hundred bales of his opulent neighbor, and thus goes to market in a much better condition and with greater probabilities of commanding a just price.

The only difficulty to be overcome in order to the establishment of an effective and adequate system of manufactures for the South, is that of population. Operatives are wanting, and not only so, *the class from which operatives are produced.* The inhabitants of the cotton States prefer agriculture to any other pursuit; and while the population is so sparse that in most neighborhoods there are thirty acres of land to every person, no considerable number of the original stock will be, by any social necessity, driven from the soil into the mills.

For this reason, nothing but a large immigration of people, not wedded to the culture of the soil, will enable the South to do more than manufacture her own cloths. The outlay and the enterprise to enable her to do *this*, are so moderate, that the immense advantages to be secured by such a course must be forced upon the attention

of all those of her citizens who are guided by a wise and enlightened self-interest.

CHAPTER VI.

OF THE VALUE OF COTTON AS A PLANT, AND THE USES TO WHICH IT MAY BE APPLIED.

The peculiarity of cotton is that it alone, of all products of the vegetable kingdom, meets a grand and universal demand of the race. Flax is the only other plant cultivated to any extent for the purpose of making fabrics from its tissue. But in any but a torrid zone, linen is unsuitable as an article for general wearing apparel.

The products of the sheep and of the silk-worm are, in some respects, superior, but they are also more costly. Nothing begins to compete with cotton as a material of dress in the union of the three important qualities of comfort, durability, and cheapness.

When, as in 1848, the average price of Upland cotton was six cents, or in 1852, when it was eight cents per pound, it is hardly possible to conceive of a cheaper dress than could then be made of cotton. Seventy-five cents, expended in plain Lowell, would clothe a laboring person in neat, whole garments, from April to October. There is no probability that it will ever fall to those figures again. It must, from the nature of things, and in any way in which the expenses can be calculated, cost from ten to twelve cents a pound to grow cotton by any other than compulsory, that is to say, unpaid labor. If, from the extensive growth of cotton in India, Egypt, and Brazil, the price of Upland Americans should fall below ten cents, general failure must overtake our cotton interests. While it ranges from ten to fifteen, prudent and economical

planters, in favorable seasons, may make more than a living.

When its price is above fifteen cents, and from that to thirty, skill and good fortune, with a reliable system of labor, must enable the cotton grower in the best parts of the cotton belt to grow rich.

The probabilities are, that, as the tumults and disorders incident to the great civil war abate, the price of cotton will slowly decline to about fifteen cents, where it must remain, in order to be a profitable crop when raised by free labor.

On this basis, the price of a yard of ordinary shirting or sheeting will be from eighteen to twenty cents, according to fineness, and a fair calico or print can be afforded for about sixteen cents. But, at these prices, below which there is no likelihood that cotton fabrics can fall, no material can at all compete with this as the universal dress. As in food, the poor man buys the largest amount of palatable nourishment when he expends it in corn meal at three cents a pound, so, when he buys the material for a plain shirt for fifty cents, there is no way of expending half a dollar by which he can buy so much of comfort, durability and neatness, as in buying three yards of unbleached domestic.

At that rate, and in summer time, the laborer can be decently covered by expending two dollars in cotton cloth.

The enormous demand for cheap cloth for the million has been so steady, ever since the gin and the jenny were invented, that only a small amount of the great staple has ever been diverted to the production of other articles useful in the domestic arts and comforts. Cotton has been called "vegetable wool," and on many accounts it answers admirably to that description. It stands half way, as it were, between the animal and vegetable kingdom, having some of the characteristic advantages of each. Fine, soft, and glossy, it reminds one of silk in the delicacy of its

feel, and can be blended with silk in composing fabrics that appear little inferior to those made exclusively from the thread of cocoons. When matted together, it produces a wad or padding, only a little inferior to wool, in warmth and elasticity. A firm and lasting vegetable fibre, it is capable, like hemp and Manilla grass, of being wrought into cords and ropes which, for evenness, pliability and strength, are equal to anything made of those materials.

As a material for beds, let us compare it with the articles in general use, and learn, first its qualities, and then its relative cheapness.

When made into mattresses, the objection, and the only objection urged against it is, that it is liable to wad, or bunch up, and thus present an uneven, and hence an unpleasant surface to the sleeper.

Ordinary cotton, as it comes from the gin, is liable to this difficulty. But if the fibre is combed out in long rolls, as in the cotton batting extensively used for coverlids, and laid in crosswise, one layer crossing the other at right angles, until the required thickness is attained, and the mattress well tacked or stitched together, so as to hold the contents just where it was laid, no such difficulty arises, and the mattress thus made is equal to wool in softness. It is a little less elastic, but as an offset, this cotton being vegetable, is perfectly sweet and wholesome, free from all animal odors, not liable to become infested with moths and other vermin, and acquires no unpleasant or musty smell, as many other substances do that are used for beds, and especially feathers.

Thirty pounds will make a good-sized double mattress. At ten cents per pound, which is about the cost of raising cotton by free labor, the filling for a cotton mattress costs three dollars; the cover about two and a half; the making-up a dollar. Thus, for six and a half dollars, the cotton grower can supply himself with a bed, equal in dura-

bility, sweetness, and warmth, to wool or hair, and only a little inferior in elasticity. But the chief advantage of cotton for mattresses is in the fact that so much less material will suffice to give the same degree of softness, as compared with other materials. A thin cotton mattress for a single bed, or for a steamboat berth, is made to contain about ten pounds of cotton. This gives a soft, agreeable couch, easily removed for airing, and one-third cheaper than any other suitable material.

As a material for bed covers its use is so extensive that little need be said by way of recommendation. For warmth and lightness combined, nothing is superior, except very soft double-rose blankets, which are a luxury that only the rich can indulge in. Four pounds of cotton batting, costing say twenty-five cents a pound, stitched between sheets of worn calico, need cost but little more than a dollar, and the amount of comfort thus obtained could be found in heavy woolen blankets only at an outlay of from fifteen to twenty dollars.

Cotton can easily be made into blankets which, for softness and comfort, are only surpassed by the finest of wool. Though not so warm as the heavy rose or Mackinaw blanket, they are sufficiently comfortable for the coldest nights in the cotton region, where the thermometer remains but a few nights in the year below 32°, and much of the time in winter stands above 40° for weeks together.

With a little ingenuity and skill, cotton can thus be made, to a family in moderate circumstances in the Southern States of our country, as great and universal a blessing as the Bamboo or the Bread-fruit is to the native of the tropics.

All that is required are facilities for developing all its useful qualities, and applying them to the production of the greatest amount of comfort.

Let us, for example, take a family living on the borders of the cotton belt in Tennessee or Western Texas, and on

the supposition that a cotton mill, such as is described in the foregoing chapter, is within ten miles, what can they do for themselves in one year by raising as much cotton as can be used in the family? We will also suppose that the family is poor, having been desolated by war, or having recently arrived in the country, and in want of many of the ordinary comforts.

They will get in their crop in April, and tend it during the spring and summer.

Early in September they begin to pick, and by the first of October have between three and four thousand pounds of cotton in the seed. At the factory, this will yield about a thousand pounds of cotton-wool, and a hundred and twenty bushels of cotton seed. Two hundred pounds of it, spun and woven into sheetings and Lowells, will give a family of ten an abundance of cloth for dress of every description, bed coverlids, bed ticking, table-cloths, napkins, towels, warp for rag carpets, and yarn for knitting into socks. Two hundred pounds, in the form of batting, will afford material for making five warm, ample, cotton beds, and five thick, downy coverlids to cover them. If sixty or seventy pounds of wool are bought, raised, or exchanged for cotton, it will give material for half a dozen warm blankets, half wool and half cotton; also a hundred yards of Linsey, for the winter wear of the whole family. A few pounds of the inferior or stained cotton can be twisted into cords and ropes for beds, plow lines, and for binding the bales of a future crop. The hundred and twenty bushels of seed could be sent to an oil-mill and sold.

In this calculation, it has been presumed that ten or twelve more bales will be raised and picked out, hauled to the mill for ginning and marketing in the usual way, which, at present prices, and after making all necessary discounts for ginning, bagging, hauling to market, and commissions and taxes, ought to bring the family some twelve hundred dollars in cash.

Thus, with no more industry or tact than is displayed in ten thousands of American families, the labors of a single season may be made to furnish ten persons, not more than three of whom are adults, an abundance of plain but warm clothing, a generous equipment of beds and bedding, a full supply of yarn, cordage, and ropes, oil enough for two years, and more than a thousand dollars in cash; beside a full crop of corn, potatoes, oats, wheat, and the usual garden vegetables. Surely there is no other crop cultivated from which such various and such ample returns can be expected, and no part of the world that affords such attractions to the industrious poor, as the higher and healthier portions of the cotton belt of North America. All that is required to make those regions the most desirable on the continent, is established and orderly society, with such a development of manufacturing skill as will enable the cotton grower to realize from this admirable plant all that its Creator has designed for the material comfort of man and his social advancement.

Some years ago, when cotton often brought its producer only six or seven cents a pound, considerable interest was felt in a discovery by which this abundant staple was to be employed as a building material. Some chemist discovered a petrifying compound, similar to Roman cement, the effect of which was to convert a mass of cotton upon which it was poured into a substance having the hardness without the brittleness of stone. He proposed to build the walls of houses by piling the cotton between planks at the requisite distance asunder, and pouring the cement upon the mass. But the importance of this discovery, however surprising, was soon neutralized by the increased price of cotton; and with the demand that now exists, and will continue to be felt for many years, there is no likelihood that it will come into active competition with brick and mortar as a building material.

Some ten years ago, a Louisiana Frenchman, named

Louis Blanc, conducted a series of experiments with the view of utilizing the fibrous bark of the cotton plant, and making of it a substitute for hemp. He arrived at some very satisfactory conclusions, and the result of his investigations may be stated as follows. If the cotton plant is taken at full maturity before damaged by frost, cut down, its lateral branches broken or cut away, and the main stem buried under a shallow furrow for ten days or two weeks, the woody fibre becomes so decayed that it may be treated like hemp, and the fibrous bark thus disengaged makes good bagging and cordage.

It has the color of the gunny or East India bagging, and is spun like the Kentucky hemp, either by machinery, or by hand.

The best way of producing it is by sowing the cotton seed broadcast. The plant, thus grown, runs up slender and puts out but few lateral branches, thus approximating in appearance to hemp. Whether the slender or the branching plant is taken, the use of it for this purpose cannot be connected with the production of cotton staple in the usual way. That is to say, a plant will not yield its full crop of bolls, and then give good hemp from the stalk.

But it will often occur that from a premature frost, or the ravages of the caterpillar, a field of cotton is stripped of its foliage, while the stalk is still green and full of life. In cases like this, a disappointed planter may find his prospects much less gloomy, if he can, at once, cut down his stalks and produce from the bark almost as many bales of cotton stalk hemp as he would have harvested of lint from the bolls, if his crop had matured.

The fibre thus obtained has been used by some manufacturers as a substitute for rags in making paper, and is found to answer an excellent purpose. In some soils, as for instance that of the lower Mississippi bottom, cotton tends to rankness of growth rather than productiveness,

and it may be found that more could be realized by raising the plant for its hemp, than by cultivating it exclusively for its lint.

But this use of the plant is to be developed by future industry and experiments. As yet, no planters have engaged in its culture for the purpose to such an extent, or with a skill and system that enables us to form any reliable opinion as to the practical importance of this discovery, for which Mr. Blanc has taken out a patent. The price of cotton-wool must decline considerably below the price it now holds, and is likely to keep for some years, before the attention of cotton growers will be drawn from the boll to the stalk; unless Mr. B., or some other inventor, shall discover some way of making the stalk useful after it has ceased to produce bolls, and all the open cotton has been picked.

If facilities for converting the seed into oil are wanting, let it be used as manure. In this form, it is worth at least twenty-five cents a bushel, and it is better policy, as a rule, to feed it liberally to the corn, and then feed the corn to the stock. Seventy-five or a hundred bushels, applied to an acre of corn, will about double the yield. If it would give fifteen bushels without the cotton seed, it will yield thirty with this dressing. Nor does its effect cease with the first crop grown by its aid. Corn land, thus fertilized, if planted the next year in cotton, yields a third more, and its effect has been found to last for five years after it was applied.

In a previous chapter, where the analysis of cotton-wool and cotton seed are given, it appears that the latter is especially rich in potash, in lime, and phosphorus, the three grand elements of fertility. As a special and lasting manure, cotton seed is surpassed only by bone-dust, superphosphate of lime, and Peruvian guano.

Finally, as closing this recital of the virtues and uses of the cotton plant, it may be added that Southern phy-

sicians have found the tea of its root, or a decoction of it, reduced to a syrup, a valuable antiperiodic. It counteracts in the system the poison of those rich bottoms and wide alluvial savannahs where the plant flourishes and attains its greatest perfection.

CHAPTER VII.

THE PAST AND THE FUTURE OF COTTON; ITS HISTORY AND STATISTICS.

As a power in the world, as a prominent feature and main element of civilization, cotton is a child of the nineteenth century. When men who are now old were children, cotton and goods made from it were spoken of something as we now speak of Japanese porcelain, or mantles from Afghanistan, as of articles rare and foreign.

In this country, a little was raised by almost every thrifty farmer for domestic consumption. The seeds were separated from the lint by hand, at the rate of about a pound in a day, and the staple was spun and mainly used for knitting into stockings.

There are neither in Homer, the Hebrew Scriptures, or other early writings, any allusions to garments made of cotton. The skill of the early nations in the manufacture of fine linen and in the weaving of wool is so frequently alluded to, that if there had been any such thing as cotton cloth known in the times of Homer and Solomon, there must have been reference to them. Some four hundred and fifty years before Christ, Herodotus, in whose writings almost everything that was known in the ancient world is described, refers to cotton very distinctly, and describes it as a wool-bearing tree in India, "which has for its fruit,"

he says, "fleeces more delicate and beautiful than those of sheep."

Two of the generals of Alexander, when they returned from the far East, brought back the first detailed accounts of the cotton tree, its product, and the extraordinary fabrics woven from it.

By degrees, cotton cloth from India was gradually introduced to the polite nations of the old world, and just before the commencement of the Christian era, the Romans seem to have imported quite large amounts of it, so much so that Verres, a cotemporary of Cicero, made awnings of it when he was in Sicily. Sixty-three years before Christ, Livy records that Lentulus covered the Roman forum with a cotton awning; and thirty or forty years after, Cæsar extended a cotton awning all over the Via Sacra, from his own private residence to the Capitoline Hill, a display of gorgeous magnificence and imperial profusion which seemed, at the time, to the Romans, more dazzling than his exhibitions in the forum.

Many of these Hindoo cotton fabrics were very extraordinary when considered as the product of the rude looms in which they were woven. They have been excelled in delicacy and perfection only by employing the most consummate mechanism of modern skill. The Indian spins the cotton yarn with his fingers and distaff alone, and by long practise and wonderful patience, he acquires the art of drawing out, incorporating and twisting the fibres into a thread, almost absolutely uniform in size, and hardly larger than the filament of a spider. The only machine he uses in weaving is a rude loom, which he carries about with him, setting it up under a tree, to the branch of which he attaches the balances. He digs a little pit in the ground where a part of the gear is arranged; he sits upon the edge of the pit, thrusts his feet into it, and attaches the cords of the treadle to loops that go around the great toes. By arrangements so rude and primitive as

these, from which we should hardly expect a fair article of gunny bagging, he makes those fine muslins which the Greeks called "Gangetekoi," or Ganges goods, some of which were plain, some ornamental, and some dyed with exquisite colors.

Tavernier, a French traveler, speaks of some muslins and calicoes which he saw at Surat, "so fine that you could hardly feel them in your hand; and the thread, when spun, is scarcely discernible."

The late Rev. William Ward, Missionary at Serampore, speaks of muslins made in Bengal, so fine, that a piece requires four months to make it, and is worth five hundred rupees; this fabric, when spread upon grass and moistened with dew, is so extremely thin as to be imperceptible without careful examination. A single pound of this thread was spun out to the length of a hundred and fifteen miles, and it is only of late that this hand spinning of Hindostan has been surpassed by English machines, which produced, for the Great Exhibition of 1851 thread so fine that a pound of it would reach over a thousand miles.

There is a small district forty miles long and about three broad, lying northeast of Calcutta, which produces a staple of great fineness, but too short to be spun by Europeans, or woven by any machinery. From this cotton is manufactured, in the rude way above described, the famous Decca muslins, sometimes called webs of woven wind. On account of the wonderful fineness of these Indian fabrics, it was supposed that a very superior quality, and perhaps large amounts of cotton, might be grown in India, and thus a source opened to the English spinner from which he could supply himself, and feel a dependence less absolute upon American cotton. The experiment was a very faithful one. Several southern gentlemen, and five or six experienced overseers, men practically familiar with every detail of cotton growing, went out to India, taking with them a large assortment of improved seed, the best

of gins, models for gin-houses, and the necessary implements for cultivating the crop. They remained there some six years. Their experiments were constantly directed to overcoming the various difficulties which they found in the way of raising large crops. They came away entirely satisfied that neither the soil nor the climate of India fits it to be a producer of any considerable amount of the higher grades of cotton. The unvarying division of its seasons into wet and dry, and the quick transition from one to the other, are ill adapted to cotton, which, for its successful growth, requires a wet and warm spring, allowing the young plants to become well started and firmly set in the soil; then a long hot summer with bright days and dewy nights, and occasional showers, (but no violent storms,) to mature the bolls, and a long, dry autumn, giving full time for gathering the crop.

In Egypt, where the culture of cotton was introduced about the year 1821, the climate and soil are both favorable, and the quality of Egyptian cotton compares very well with that of America; but the quantity, owing to the dependence of all agricultural operations on the inundation of the Nile, is very uncertain, the fluctuations being extreme and beyond calculation.

The shores of Western Africa, and Yoruba, in the interior, produce cotton in large quantities, but the staple is too coarse and short for the manufacture of the finer fabrics. The distinguished traveler, Dr. Livingstone, has recently furnished much information as to the capacity of this region for the growth of cotton. He returned to Africa in the spring of 1858, prepared to prosecute the culture of the crop. Since the year 1852, Mr. Thomas Clegg has been engaged in the region of Sierra Leone, and, being provided with gins and other apparatus, so far succeeded, that in 1858, the total amount sent to England from that part of the world was nearly a hundred thousand pounds. In quality, the African cotton is decid-

edly superior to that from East India, and in fineness and length of staple ranks next to American cotton.

In the New World, the manufacture of cotton cloth appears to have been well understood by the Mexicans and Peruvians long before the advent of Cortez and Pizarro to these shores. Columbus found the cotton plant growing wild in Hispaniola, and the explorers that followed him recognized it as far north as the country bordering on the Mississippi River.

Cortez, when he set out from Trinidad, on the southern coast of Cuba, on his Mexican expedition, used cotton for padding or quilting the jackets of his soldiers as a protection against Indian arrows. He learned this from the natives, by whom it had been long used for that purpose. Arrived on the Mexican coast, among the gorgeous presents sent him by the confiding Montezuma were "curtains, coverlids, and robes of cotton, fine as silk, of rich and various dyes, interwoven with feather work, that rivaled the delicacy of painting." The Mexicans also understood the manufacture of white cotton cloths, and even possessed the art of converting them into a species of paper. In the latter part of the last century, the West Indies shipped to England something like forty thousand bales, which was, at that time, nearly three-fourths of the cotton supply. It was mostly long staple cotton, of fine quality and, considering the climate and the soil of those islands, there is every reason to believe that cotton culture will revive and take the place of sugar, which supplanted it fifty or sixty years ago.

The culture of cotton in Brazil commenced in the early part of the present century, and increased so rapidly, that for a number of years, Brazil exceeded every other country, except the United States, in the amount of cotton it produced. In many places on the coast, the climate was found adapted to the growth of long staple cotton. But, of late, the plantations have retired toward the in-

terior, and the amount produced throughout the kingdom increases but slowly. During the ten years, from 1843 to 1853, the increase was only six thousand bales, and the product of the latter year was sixty-five thousand bales. Four-fifths of the Brazilian crop is exported to Great Britain. The first production of cotton in that country was almost simultaneous with the first raised in the United States. Its export to England began in 1781, and it was 1784, three years after, that eight bags of cotton, shipped from the United States to England, were seized on the ground that so much cotton could not be produced in the United States.

The growth of cotton in Brazil is not likely for many years, and perhaps never, to attain any great importance. Along the coast the climate is unfavorable, and the ravages of insects are such as to make the cotton crop very uncertain. In the interior provinces, the difficulties of raising it are not so great; but the sparseness of the population and the slowness and the almost insuperable obstacles in the way of transportation of what is produced, must limit the amount grown.

Pernambuco is the principal cotton growing province of Brazil; but between the years 1828 and 1845, the exports from Pernambuco declined to such an extent as to make a poor showing for cotton in Brazil. In 1828, there were exported a little over seventy thousand bales of one hundred and sixty pounds each; in 1845, seven years after, the export was a little over twenty-six thousand bales of one hundred and sixty pounds each.

There is no authentic statement as to the precise time when cotton was cultivated in the British Colonies of North America, now the United States. It is probable that, from the settlement of the country, a little was raised in most of the southern colonies. In a pamphlet on the attractions of North America, published very early in 1600, a year or two after Jamestown was settled, it is

stated that cotton would grow as well in Virginia as in Italy; and in the very last part of that century, another authority states that Sir Edmund Andros, while Governor of Virginia, in 1692, "gave particular marks of his favor towards the propagation of cotton, which, since his time, has been much neglected." Up to the time of the Revolutionary War, so little was raised that it deserves no mention as one of the American exports. Within ten years from the Declaration of Peace between the United States and England, cotton culture received an amazing impetus from the discovery, by Eli Whitney, of a rapid and effectual mode of separating Upland cotton from its seed. The manner in which the attention of young Whitney was drawn to the invention of the cotton-gin is a matter of so great interest that the following brief statement is copied from the memoir of Eli Whitney, written by Professor Olmstead, of Yale College:

"After leaving college, Mr. Whitney, who had already distinguished himself for his mechanical skill, and for bold and self-relying enterprise, almost immediately went to the State of Georgia for the purpose of fulfilling his engagement with a gentleman to reside in his family as a private teacher." This was in the latter part of the year 1792. On his way to Savannah by ship, he had as a companion of his voyage, the widow of the then late General Greene, so distinguished in the annals of our revolutionary history. On his arrival at Savannah, being but partially recovered from the small pox, which he had by inoculation, he was invited by Mrs. Greene to spend a little time at her residence at Mulberry Grove, near that city. He soon learned that another teacher had been employed in the place which he had expected. Mrs. Greene at once kindly and generously proposed to him to commence the study of the law under her hospitable roof, and to remain in her family as long as he should choose. He had not been long with her before he gave striking proofs of his mechan-

ical ingenuity, which attracted the attention of Mrs. G., and led her to feel that Whitney could meet any exigency in which invention and skill of this kind were required. Not long after, Mrs. Greene was visited by several gentlemen from upper Georgia, principally officers, who had served with her husband in the war. Of these were Majors Brewer, Forsythe, and Pendleton. They conversed largely upon the situation and prospects of agriculture in the opening upper country of the South, and expressed regret that no means had been devised to clear the Upland cotton from the seed, saying, that unless such a point could be obtained, it was vain to raise cotton for the market. Mrs. Greene interrupted their conversation, by saying, "Gentlemen, apply to my young friend, Mr. Whitney; he can make anything." After showing them, as the results of his ingenuity, the various mechanical contrivances which he had devised and executed, she introduced him to the circle, who at once made known the object to be accomplished, and the difficulties which were in the way. Whitney, in reply, disclaimed any superiority of mechanical genius, and added that he had never in his life seen either cotton or cotton seed. Mrs. Greene then said: "I have accomplished my aim. Mr. Whitney is a very deserving young man, and to bring him into notice was my object. The interest which our friends now feel for him will, I hope, lead to his getting some employment to enable him to prosecute the study of the law."

The hint given to Whitney by these gentlemen was not lost upon him. The season for cotton in the seed was passed, but Whitney went to Savannah at once, and after a long search, at last lighted upon a small quantity; with this he returned to his temporary home and communicated his intentions to Mr. Miller, who was then a teacher in the family and afterwards married Mrs. Greene. A room was assigned to him to which Mr. Miller and Mrs. Greene were the only persons who were admitted, or who knew

anything of his project. His materials and tools were both limited; even the wire which he required could not be found at Savannah, and he was forced to draw it for himself. Near the close of the winter the machine was so nearly completed as to leave no doubt of its success. Mrs. Greene was naturally eager to communicate to her friends the fact of an invention which promised at once a great staple, precisely adapted to their soil, occupation for their hands, and immense wealth, as the result of an extended culture of an article which had been thought of little worth. She invited to her house gentlemen of distinction from different parts of the State, and conducted her assembled guests to the room in which they saw with astonishment a machine which promised such splendid results for all their interest.

The petition for a patent was presented to Mr. Jefferson, the Secretary of State, June 20, 1793. Mr. Jefferson at once took a strong interest in the invention and its originator, and assured Mr. Whitney that his request should be granted as soon as the model was lodged at the Patent Office. In consequence of unavoidable delays, however, the patent was not secured in form until several months afterwards.

Like many other inventors, Mr. Whitney was destined to wade through a series of tedious and vexatious litigations before he realized anything like an adequate personal return for his ingenuity and skill. But the effect of his invention was immediately seen in the extraordinary increase in the cultivation of Green Seed or Upland cotton. Within fourteen years of the time when he first made the discovery, the importance of the invention and its effect upon Southern agriculture and prosperity are set forth in terms as follows, by Judge Johnson, of Savannah, in a suit to sustain the validity of Whitney's patent:

"The Green Seed is a species much more productive than the Black, and by nature adapted to a much greater

variety of climate. But by reason of the strong adherence of the fibre to the seed, without the aid of some more powerful machine for separating it than any formerly known among us, the cultivation of it would never have been made an object. The machine of which Mr. Whitney claims the invention so facilitates the preparation of this species for use, that the cultivation of it has suddenly become an object of infinitely greater national importance than that of the other species ever can be. With regard to the utility of this discovery, the whole interior of the Southern States was languishing, and its inhabitants emigrating for want of some object to engage their attention and employ their industry, when the invention of this machine at once opened views to them which set the whole country in active motion. From childhood to age it has presented to us a lucrative employment. Individuals who were depressed with poverty and sunk in idleness, have suddenly risen to wealth and respectability. Our debts have been paid off, our capitals have increased, and our lands trebled themselves in value. We cannot express the weight of the obligation which the country owes to this invention. The extent of it cannot now be seen."

A study of the statistical tables, giving the product of cotton for different years, its price, the supplies that come from various parts of the world, and the distribution of the cotton raised throughout the world, so far as can be ascertained, will serve to impress upon our minds the wonderful commercial results that have followed this invention of Eli Whitney, and will throw much light upon the question as to whether the cotton culture of the United States is likely to be impaired by the amounts produced in other countries. When the gin was invented, England received from America only one bag in a hundred and twenty-six. Three years after, in 1795, she received one in twenty-five, and at the beginning of the present century, about one-eighth of the importation was from America. In 1820,

about two-thirds of all the cotton brought into England, was from the United States. At present, or rather at the outbreak of the late Civil War, England was dependent on America for seven-eighths of her cotton supply. From 1806 to 1830, the crop of the United States did not vary greatly from a million of bales annually. From 1830 to 1840 there was a steady increase, though not without fluctuations produced by unfavorable seasons, until, in the latter year (1840,) for the first time, the crop went a little over two millions.

Between 1840 and 1850 the annual crop ranged between two and three millions, except on three years, when it fell back to about a million and three-quarters. The crop of 1852 was the first in America that ever went over three millions. From that time to the crash of the cotton interest, produced by the war ten years after, the crop ranged between three and three and a half millions, except on three years, as in the former decade, when, on account of an unfavorable season or the worm, it fell below two millions. The cotton interest was never so thriving as immediately before the war. By the law of increase which we have observed in the foregoing statistics, the crop of 1862 should have been four millions of bales, and by the same law should, in four or five years from now, (1867) be approximating, at least, to five millions of bales. A similar increase may be noted in the average price of cotton per pound as in the amount produced; but the fluctuations here have been much greater. The highest price realized for any crop previous to the war was for that of 1820, the highest grades of which sold on an average for about thirty-four cents per pound. It fell away in 1830 and 1832 to nine cents as an average price, and then continued to rise until 1836, the crop of which year sold for nearly seventeen cents per pound; after which there was a general though fluctuating decline, the lowest price being realized for the crops of 1843, 1845, and 1849,

which brought the planter but little more than six cents a pound. From 1849 on until 1864 the increase was steady, until the outbreak of the war, and then enormously rapid. The average price realized for the crop sold immediately before the outbreak of the war was about thirteen cents.

The value of that part of the crop which was exported, generally three-fourths of the whole amount raised, was something less than one hundred and forty millions annually, for two or three years previous to the war. The lowest amount received by the planter was for the crop of 1831, which sold for only twenty-five millions of dollars, its average price per pound being only nine cents. The quantity absorbed by the home market in 1856, a little more than three-quarters of a million of bales, and worth about thirty millions of dollars, was, by a moderate estimate, made to produce nearly five times this sum by the industry applied to its manufacture in the States north of Virginia. In 1856 and 1857, Mr. J. B. Gribble, of New Orleans, prepared a table presenting the distribution to various countries of the entire cotton crop raised in all parts of the world. According to his estimates, the whole amount produced was a little over four millions of bales. He assumed the average weight of packages of raw cotton to be: From the West Indies, a hundred and seventy-three pounds; Brazil, one hundred and eighty-one; Egypt, three hundred and six; East Indies, three hundred and eighty-five; and the United States, four hundred and forty. Reducing all these bales to four hundred pounds each, he arrives at the following conclusions with regard to the crop of 1856 and 1857, which may be taken with very slight modifications as the true exponent of the cotton interest, and the best summary of cotton statistics at the time when this great staple was at its maximum development, just previous to the war: The product of the West Indies, a little over four thousand bales; of Brazil, five thousand five hundred; of Egypt, eighty-six thous-

and, four hundred and forty-five; of the East Indies, four hundred forty-five thousand, six hundred and thirty-seven; and for the United States, three millions, eight hundred and eighty thousand, five hundred and eighty—or nearly seven-eighths of the product of the world.

Of this whole amount, a little less than half went directly to the English mills; one-sixth was manufactured in America, and the balance in other European States.

A study of the tables prepared by Mr. Gribble, those contained in the New Orleans Price Current, and those in the New York Shipping and Commercial List, though varying considerably in their details, as all such tables will, and none of them more than proximately correct, has brought me to the following conclusions:

I.—The regular increase in the growth of American cotton from the year 1830 to the outbreak of the Civil War was at the rate of an additional million of bales about every ten years.

II.—The fluctuation in the amount of American cotton produced has always been moderate; thus, for instance, between 1830 and 1840, the crop in three years went below the figures of 1830; then again, between 1840 and 1850, the crop went three times below the figure of 1840; thus apparently establishing the rule that drought, frosts, or the caterpillar, may be expected materially to diminish only three crops in ten on American soil.

III.—When a crop is once stowed in bottoms at the great exporting towns, the country to which it shall go is a matter determined almost entirely by the facilities for manufacturing which different countries afford; and as in England there is, at present, a combination on the largest scale of cheap motive power with cheap labor, England will continue to receive the largest amounts of cotton as long as her coal is abundant and low-priced. In 1860, she manufactured half the cotton produced in the world.

IV.—The cotton manufactures of Great Britain have

advanced *pari passu* with the development of cotton growing in the United States; her looms, spindles, and her markets, are all adjusted to the staple of American Upland, and this is the style of cotton of which she requires the greatest quantities. American cotton cannot be replaced in her mills to advantage by that grown either in India or Africa, and no other manufacturing nation is prepared to underbid England in the production of the finer qualities of cotton fabrics, especially muslins. Up to 1860 the cotton supply from other sources than the United States had increased in some cases very slowly, and in others decreased; the principle increase being from East India and Africa, which furnish the poorest staple.

V.—England can feel no reliance for her cotton supply upon any other country than the United States, and the American supply is, in general, very reliable whenever the system of labor is settled and permanent. Whatever cotton can be produced upon American soil will find a prompt market in England, and until the supply from America passes two million bales, which are necessary to keep all the spindles of England in motion, there is no probability that cotton will fall below fifteen cents, and, probably, it will not go so low as that for quite a number of years.

About ten years before our late war, a writer in the London Economist, an English paper devoted to the examination of questions like this, traced the progress of the cotton trade from 1838 to 1850, and the facts, as then known, brought him to the following conclusions:

That the supply of cotton from other sources than the United States has been irregularly decreasing; that, including the United States, the supply from all quarters available for English consumption had, of late years, that is from 1840 to 1850, been falling off at the rate of a thousand bales a week, while the consumption had been increasing at the same time at the rate of thirty-six hun-

dred bales a week; that in the United States alone, the growth is increasing, but limited there to about the same ratio as the increase of the colored laborers, that is, five per cent. per annum, an increase barely sufficient to supply the growing demand for its own consumption and for the continent of Europe; and that, consequently, if this branch of industry is to increase at all, on its present footing in Great Britain, it must be by applying a greater stimulus to the growth of cotton in other countries adapted to its culture. The incapacity of other regions to supply the demand being shown, the writer looks to the British West India Islands, and the African and Australasian colonies as most likely to make up the deficiency.

From the year 1860 to 1865 the question of the cotton supply was one of intense interest, on account of the almost entire withdrawal of contributions to the cotton market from the American States, coupled with very grave doubts whether for many years, at least, the state of things in those unhappy regions would admit of settled and successful industry. But we have seen that under the enormous stimulus of, at times, a dollar a pound, and, most of the time, fifty cents and over per pound, for the last four years, that the supply from other countries than the United States has not been greatly augmented; and now, as cottons are slowly declining, the figures are falling back to about what they were before the war. The effect is not that the world gets along without American cottons, but rather that in view of the diminished supply from America, the consumption of cotton has decreased, and that of linen, silk, and woolen, especially the latter, has increased. But this diminished consumption is an enforced and unnatural state of things. The demand for manufactured goods throughout the world is largely increasing, and the proper conclusion to be drawn from all these facts and figures is, that no part of the world, during the present century, has offered or is likely to offer so large a field

for common, unskilled labor, with returns so certain and so generous as the cotton States of the North American Republic.

CHAPTER VIII.

PRACTICAL SUGGESTIONS AS TO VARIOUS CLASSES OF PERSONS WHO PROPOSE TO ENGAGE IN COTTON GROWING.

With such attractions and natural advantages as the cotton States possess, and with commercial reasons so cogent as those presented in the last chapter for believing in a future for cotton growers in America more brilliant than anything in the past, it is not to be presumed that political disorder will, for any great length of time, seriously embarrass the cotton interest. For a while it must be supposed that the cotton growing interest will be greatly deranged. There has been and will continue to be considerable difficulty every spring in obtaining good seed; the caterpillar and the army-worm are more likely to commit their depredations in seasons when the breadth of lands in cotton is smaller than usual, and the culture has been languid and imperfect. With cotton at an average of ten cents per pound, the South for thirty years before the war was rapidly increasing in wealth, and the law of increment appeared to be such that the crop doubled itself every twenty years. Now, with cotton at two or three times that price, and a larger amount of labor seeking employment throughout the country than ever before, it is not credible that political differences and uncertainties can long arrest the march of the great laws of political economy. It requires little sagacity to predict that this transition state cannot last long, since society is so rigidly controlled by its material interests as not to

permit the continuance for a great length of time of such a state of things. One great effect of the recent radical changes in Southern society has been the opening of the cotton fields of the South to the labor of all races, instead of their being restricted to the labor of one, and in giving scope to every class of industrial enterprises and to varied forms of organized labor. Up to the year 1860 there was, practically, but one way of raising cotton, but one class of persons who performed the labor, and but a single and unvarying system for applying that labor to the soil. Now those lands can be and are likely to be possessed and tilled, in many instances by large joint stock companies, whose operations extend over an area of perhaps twenty thousand acres, and whose business reaches annually to hundreds of thousands of dollars. Enterprises like this were impracticable and unknown under the former system. Very large amounts of cotton, greater, perhaps, than by any other method, will be grown, as grass and wheat and corn are produced, in the Northern and North-western States, by the labor of the land-owner himself, who, with the aid of one or two assistants in summer, cultivates the forty, sixty, or eighty acres of which he holds the fee simple. There will be opportunities, also, for the successful application of another class of labor to the cultivation of this crop; the owners of those large tracts of from three hundred to three and four thousand acres, having no means of cultivating such a breadth, will be very willing to rent it to any industrious person who, without capital, has a disposition to work, and the proprietor will receive his pay in a share of the crop raised. As soon as the composure of society is such as to give ample security to both life and property, and such is believed to be the case by the Northern and European States, there must be a large influx of both population and wealth into the cotton region. These accessions to society then will naturally be divided into three general classes.

First—The large capitalist and the joint stock companies of Northern cities, who will engage in cotton raising with the same energy, the same skill, and the same generous appropriation of funds which have characterized their operations in coal mines, railroads, oil wells in Pennsylvania, and stamping mills in the Rocky Mountains.

Second—A larger class will be those who bring some capital, a large amount of intelligence, sagacity, and industry, and who propose to cultivate cotton farms where this shall be a specialty, but by no means an exclusive crop. This class are the best that can migrate to any country, and if they go South in any considerable numbers, they will soon impose a law of their own upon society.

Third—A class much larger than either of the two mentioned above will be the common laborer, the impoverished American, the German, the Irish, and eventually the Chinese, who will engage in the labor of tilling and harvesting the crop in precisely the same spirit as that in which they have built railroads, tunneled mountains, excavated canals, and removed the fertilizing deposits upon the Lobos Islands to the wheat fields and the gardens of England and America. A majority of them, probably, will be employed by the large capitalists and the stock companies; others more thrifty and self-reliant will, at first, find employment with the small producers, and from this will soon come to be themselves planters on soil which they have earned by hard labor.

There are certain parts of the cotton growing regions which are especially suited to each of these classes, and this treatise cannot, perhaps, be concluded by anything more useful or practical than a few suggestions to each of these various classes of immigrants, the advice, if such it may be called, being directed, mainly, to such questions as naturally arise with regard to soil, climate, salubrity, facility of transportation, and social surroundings.

The large capitalist and the joint stock company who go into the cotton business precisely as they would into an oil speculation, or a silver mine, will, of course, make every other consideration bend to that of profit. The question with them will be, where and how to produce cotton in such a way that a hundred thousand dollars invested in the business will yield from twenty-five to fifty thousand dollars annual returns. The salubrity of a country, the agreeableness of the inhabitants as neighbors, the distance from schools, churches, and villages, are matters of minor importance with those who are seeking principally the almighty dollar. The two grand requisites which the capitalist asks for in order to make a profitable investment, are a fertile soil, and easy and cheap access. Of course he must feel himself, to a great extent, secure from inundation and, if possible, from the ravages of insects. He will hardly look at any other lands than rich alluvions, of which there is a great abundance throughout the cotton belt. He will find the requisite degree of fertility in any of the superior cotton lands which are capable of producing a bale or more per acre, without manure and without rotation. These on the tinted map, which faces Part II., Chapter I., are colored red. By examining that map, it will be seen that four of the Gulf States furnish a large body of land of this description, and his choice will naturally be made of one of these four States, Alabama, Mississippi, Louisiana, including the southeastern corner of Arkansas, and Texas. The superior lands of South Carolina and Georgia are much more limited in extent, held at higher figures, and not so much in market. This is true to quite an extent of that admirable body of black land in Alabama which lies between the two main rivers of that State, the Alabama and the Tombigbee, and which is fully described in the chapter connected with the cotton map. As regards health, these cotton fields of Middle Alabama are more desirable than any other rich lands in the South,

unless it be the black prairies of Texas, which they very much resemble. They are entirely secure from overflow and quite easy of access both by river navigation and railroad; at least, the access to Mobile and the Gulf of Mexico is ready. The objection in that regard is, that communication towards the North is circuitous and expensive, and in a few years another serious objection with a company or capitalist that proposes to connect the manufacture with the production of cotton, will be the lack of fuel. Coal, said to be bituminous in quality and very excellent, exists in Alabama. "A vein of this coal is first seen," says De Bow in his Industrial Resources, "in the bed of the Black Warrior River, near Tuscaloosa, and pursues a north-east direction until it crosses the Alabama and Coosa Rivers at, or just above, their falls, and probably thence passes into Georgia." But the bed has never been worked to any considerable extent, and it is still problematical whether it is sufficient in width and dip to furnish large amounts. At present, on the Southern borders of this triangle of land there are extensive forests which, for some years at least, will supply all necessary fuel for manufacturing and domestic purposes; so that the difficulty suggested is by no means formidable or insuperable. It is simply a matter to be taken into consideration by the capitalist, who may be seeking an investment in cotton lands, which shall be in all respects most fortunate and judicious. In the Trans-Mississippi region, that is to say, in the river bottoms and black prairies of Texas, there is presented another large body of superior lands, similar to those of Alabama in the color of the soil, almost identically situated in regard to communication with the Gulf, and capable of satisfying any one as to their depth of loam and the permanence of their fertility. They are somewhat larger in extent than those of Alabama, and have the advantage of being virgin soil, the greater part of which has never felt the share. It is less favorably situ-

ated, however, with respect to moisture, especially the western part. The seasons of Alabama are such, that all crops that can be cultivated in that climate grow well and come to maturity. In Texas, particularly Western Texas, there is moisture enough for cotton and for grass, but three years out of five the corn crop is a failure for want of rain. The objection suggested to the best lands of Alabama, that they are difficult of access from the North, applies with still greater force to the cotton region of Texas. Railroads from Vicksburg and Memphis have partially penetrated to those regions from the east and north-east, but land carriage of a crop so bulky as cotton for a distance of four hundred or five hundred miles is so tedious and expensive as to be well nigh impracticable on anything like a large scale. On the other hand these lands, considering their very fine quality, are cheap; they can be obtained for about a hundred per cent. less than lands of equal intrinsic value in the older States. From ten to twenty-five dollars per acre, according to situation, will place the capitalist in possession of lands admirably suited to his purposes. How far cheapness on the one hand outweighs remoteness on the other, and to what extent intrinsic value is offset by difficulty of access, are matters about which good business men will differ. If a permanent investment is sought, and it is proposed to unite manufactures with agriculture, the want of fuel would be eventually a more embarrassing question in Texas than in Alabama. According to Haldeman's revised edition of Taylor's work on the Coal Regions of the United States, coal exists on the Trinity River two hundred miles above Galveston, near Nacogdoches, and also near Austin, in considerable quantities; but like the carbonaceous deposits of Alabama, those of Texas have never been worked, and it is doubtful whether they will be able to supply the place for fuel of the pine forests of which there is great extent in the eastern part of the State.

These facilities for cotton growing and attractions to capitalists in the two States which lie to the right and to the left of the region that drains into the lower Mississippi Valley have been first discussed, in order to show that the last mentioned section presents decidedly a more attractive field than either.

Let us turn now to this teeming valley and examine that part of it which lies below Memphis, with a view to investments in cotton planting. From the mouth of the Mississippi up to where it receives the waters of Red River, the banks of the stream, though inexhaustibly fertile, are unsuited to cotton. That part of Louisiana which lies south of Red River, is the sugar bowl of the Union; the soil is not sufficiently light and sandy for cotton. It is a firm, strong, tenacious, clayey loam, rich in vegetable mould, the natural growth of which is cypress, live oak and palmetto, and cotton, when planted there, presents a rank and luxurious growth; but the vigor of the plant does not expend itself upon the fruit, as is the case a hundred miles farther north. At Red River the cotton lands commence; the lowest part of the Red River valley, for seventy-five miles before it empties into the Mississippi, is almost an unbroken swamp. The land is of the greatest fertility, but is covered almost every year by inundations, the water standing upon it in some places three inches deep, and in others twenty feet, and depositing annually a layer of fine fertilizing mud. If some way could be devised for redeeming this part of the Red River valley from annual overflow, several hundred thousand acres of land, as rich as the bottoms of the Nile, would be added to the cotton lands of Louisiana. Ascending the stream we find, in the vicinity of Alexandria, and for a short distance up the valley, a group of sugar plantations; above these, as far up as Shreveport, and for a hundred miles beyond, in Arkansas and Texas, cotton alone is planted. Among the superior cotton lands of the South, those of Red River

stand preëminent; they are easily protected from overflow, the soil is an alluvion, as rich in the elements of vegetable life at the depth of fifty feet as at the surface; the seasons are well suited to the growth of corn and various other edible crops; and this magnificent valley is flanked on either side by a wide extent of pine forests, veined with narrow but fertile creek bottoms, affording a broad range for the stock of river plantations, and a supply of fuel that it will take generations to exhaust. The objections to this country are the miasms of the river bottom and the absence of good water, requiring the construction of a great number of cisterns, or of arrangements for filtrating the river water; but with all due allowance for these discounts, there are no lands in the world which offer greater inducements than these of Red River, to the large capitalist or the enterprising stock company who aspire to brand their cotton bales by the thousand. A bale and a half and two bales per acre is no uncommon yield; for something like eight months in the year the access to New Orleans and the Gulf by steamboats is unembarrassed. No part of the whole Southern country can present so many instances of magnificent fortunes, accumulated by a few years industry, as might have been found in 1860, in passing as the traveler did for four hundred miles from Alexandria up through a series of superb planting estates.

If, instead of descending Red River for the purpose of reaching the Mississippi, the traveler should pass directly east from Shreveport, in the direction of Vicksburg, he would for some seventy-five miles ride through pine woods broken here and there by a little strip of fertile land. This section is marked green on the cotton map. On approaching the valley of the Ouachita, the scene undergoes a sudden and total change. The pine hills suddenly stop, the growth becomes cypress, cane, sycamore, sweet gum, tupelo gum, and poplar, all indicative of the richest soil and the most

perfect adaptation to the growth of cotton. These lands extend eastward to the waters of the Mississippi, a distance of some sixty miles. Here, at Vicksburg, we may pass over into the State of Mississippi, and on the right bank of the river, as we ascend, there is a similar body of land from twenty-five to forty miles in width, and extending all the way from Vicksburg to Memphis. The first, and we may say almost the only question which the capitalist will ask with reference to this entire tract of land is: What parts of this unequaled soil are exempt from annual inundation? The facilities for transportation are almost unparalleled; on thousands and tens of thousands of plantations there would be no practical difficulty in building the gin-house or the factory in such a way that the bales of cotton might be allowed to slide directly from the press-room to the deck of a steamboat. The soil here is quite uniform in the degree of its fertility, as may be seen by the uniform growth with which it is covered. It may be remarked, also, that the disasters of the late war have fallen heavy upon this region, deranging titles, divesting estates, and placing immense bodies of these lands within easy reach of capital. The plantations which lie directly upon the Mississippi have this advantage, that they are in easy and immediate communication with the great cities of the Northwest, so that the produce of these lands could be taken at once either up or down the river, and discharged at St. Louis, at New Orleans, at Memphis, at Louisville, or Cincinnati, according to the drift of commerce and the facilities for manufacture. An establishment such as is described in Chapter V, Part II, of this Treatise, might be located in Missouri, in Southern Illinois, in Western Tennessee, or on the Ohio River, and receive its supplies of cotton in the seed from plantations five hundred miles distant, and the freight be so moderate as to be more than offset by the cheapness of labor and the abundance of breadstuffs in the more northern situations. There is no

difficulty at all with regard to fuel in all this region; the entire valley is covered by a dense forest growth, the removal of which, for purposes of fuel, will probably be found quite too slow to meet the demand for more open land; and when all the forests near the front are cut away, a flat boat, loaded with several hundred tons of coal, can be floated down from the upper Ohio and landed at any point along the great river for a few cents more per bushel than would be its cost at Cincinnati.

Everything in the situation and in the natural surroundings and facilities afforded by this region, seems to point to operations to be conducted on a large scale, with command of ample capital; all the improvements of modern ingenuity and business enterprise being made to contribute to magnificent results, where the inexhaustible fertility of the soil, taken in connection with the constant and cheap access to all other parts of the country, shall present a combination of agricultural and manufacturing skill which has never yet been equalled on this continent. Here is a soil and climate perfectly adapted to the growth of cotton, in connection with the sources of a motive power inexhaustible as the coal beds of the West, and all washed by the waters of a mighty inland ocean so deep that the Great Eastern might be floated a thousand miles inland, and then steam direct from the gin-houses that will dot the bank of the mighty stream to the Liverpool docks.

But these rank and wide alluvions, teeming with luxuriant vegetable growth, are not the only cotton lands of the South. There are sections which are as attractive to the farmer of moderate means, who desires to establish a Southern home, as the former to the capitalist hunting for a lucrative investment. The grand objection to the greater part of the very fertile lands above described, is that they are unsuitable for homes and as locations for family residences. The surface is commonly a dead level; the

water, except that which descends from the clouds, never good; the air often loaded with feverish miasms and swarming with musquitoes. He who seeks a suitable place where he may build him a home, in an air that is free and wholesome; where the water is pure and abundant; the scenery not without some picturesque attractions, and the social surroundings agreeable, will not select an alluvial tract. By reference to the cotton map in the early part of this Treatise, a large breadth of country will appear tinted yellow; this indicates hill lands where, in general, the soil, without special treatment, does not yield a bale to the acre, but where the other conditions of comfort and well-being are much more easily supplied. These are the sections that should be visited by the man who proposes to buy a hundred or two acres, and to raise, among other crops, twenty or thirty bales of cotton. Perhaps the first locality that will attract a man with views and plans of this character, will be the country south of Nashville, bounded on the east by the Cumberland Mountains, and on the west by the valley of the Lower Tennessee. There is no first class cotton land here except, perhaps, a few narrow strips along the river bank in North Alabama. The seasons here are too short for the production of full crops, but in a great number of minds this circumstance would be considered as more than offset by the extreme beauty of Middle Tennessee, the lovely slopes of emerald, the noble wealth of oaken forests, the clear running streams, the perfect healthiness of the climate, and the high tone of social refinement and morality that pervades the community.

Another redeeming feature by all means deserves mention. With the Tennessee farmer, cotton is only one of several crops which he can successfully cultivate; the land produces excellent tobacco. A few years ago Tennessee was the leading State in the growth of corn. The apple, pear, and peach tree, flourish; hemp is a profitable crop,

and wheat is largely raised. The titles to lands have been considerably disturbed by the war, and there are a large number of acres in every town that can be obtained at moderate prices. Except in a few instances the lands of Tennessee are divided into tracts of moderate size, seventy-one acres being the average of improved land in each farm, so that the man of moderate means who is looking for a farm where he can, in a favorable season, raise a few thousand pounds of cotton with most of the other American crops, need not pass south of the Tennessee River in his search. The same remarks here made of Middle Tennessee apply with some modifications to the north-eastern counties of Mississsippi, and the northern parts of Alabama and Georgia. Much of the surface here is broken and sterile; in many counties wheat is the leading crop, but nearly every farmer raises a little cotton. The landscapes are not so attractive as those of Middle Tennessee, nor the water so good, there being, in this respect, wide differences in adjoining counties. The northern and particularly the north-western counties of Arkansas are admirably adapted both as to soil, climate, and the degree of moisture, to the wants of the cotton farmer as distinguished from the cotton planter. The present objection of remoteness and difficulty of access is being rapidly overcome by the building of railroads; there is no part of the entire South where the man of moderate means can obtain, on better terms, a tract of, say two hundred acres, on which he may grow corn, wheat, oats, potatoes of both kinds, and send to market from ten to twenty bales of cotton, from which to realize the principal part of his clear income. As farming can be successfully combined with cotton growing in the sections just mentioned, so the joint production of cotton and beef is eminently practicable in a wide range of counties in the northern part of Texas. They are mostly prairie lands, where stock-raising is the first and the natural occupation of the inhabitants; but

the soil and climate both are well adapted to cotton. That region is still, for the most part, wild and sparsely inhabited; lands of great intrinsic value can be obtained at very moderate prices, the average not rising above five dollars an acre.

The immigrant who carries into the cotton growing States no capital but his two hands, must, of course, at first, be almost wholly governed in the selection of his field of labor by the grand consideration of demand. Waiving all other questions, the laborer will be certain to go where he can get the highest wages; and the large planter, the capitalist, or the joint stock company, who are in possession of a tract of alluvial soil on some of the great navigable streams, will offer him the greatest inducements. With cotton at thirty cents a pound, on a soil that produces a bale and more to the acre, there is no reason why the laborer should not receive handsome wages; the cotton grower who pays two dollars a day to a good hand can, if his crop succeeds, clear over two hundred dollars on each hand. When cotton declines in price, the value of labor in the cotton crop must fall; but as long as it continues at the present high figure, there is no reason why the laborer should not enjoy the benefit of it as well as the land-owner or the speculator. The more intelligent and thrifty a laborer is, the more rapidly will he rise from the position of a hireling; there is no need that the industrious and economical working man should long remain landless. The savings of a single year will enable him to buy as much land as he can till in cotton; as soon as he can secure a title or get legal possession of fifteen acres and a mule, he can begin to be independent, and from this beginning, hard work, economy, and thrift will, in a few years, make him a hundred-bale planter. It should be remarked, however, that much precaution is required if he would avoid loss of time and the impairing of his constitution by sickness. The rich cotton lands are, generally

speaking, malarious; chill and fever, to some extent, he cannot remain exempt from, but two or three simple rules, strictly observed, will enable the laborer on swamp land to retain his health in a large proportion of cases.

First—No night work. The air of a malarious bottom is healthy enough while the sun falls upon it, but at dusk the poison begins to settle and enters the system through the pores as well as through the lungs.

Second—Flannel next to the skin the year round. It is more important in southern than in northern climates, because the contrast between the temperature of mid-day and midnight is much greater.

Third—At the time of the early frosts and throughout the winter, the laborer should, by the terms of his contract, be furnished with a cup of hot coffee early in the morning. No other drink is so well suited to counteract the febrile tendencies of that season; it is far more effectual and less mischievous than any alcoholic drink.

With regard to the summer heat of the more elevated and northerly parts of the Gulf States, Arkansas and Tennessee, we find the line of mean summer temparature starting from near the centre of the coast of North Carolina, passing nearly westward through the centre of South Carolina and Georgia; thence it turns northward through Northern Alabama across Tennessee and the western extremity of Kentucky into Southern Illinois. Thence it bears southward again, through Southern Missouri and Northern Arkansas.

The Anglo-Saxon has never considered it any particular hardship to till the soil in Missouri, yet its summer heat is as great as that of Middle and Northern Georgia, and the temperature and health of Southern Illinois will not compare favorably with those of Middle Tennessee. A survey of the map connected with this volume will show a broad tract of cotton country lying in Georgia, South Carolina, Northern Mississippi, Alabama, Arkansas, and

Texas, the land of farms, not of plantations, on which a million and a half of bales have been produced in a given year, of which a very large proportion was grown by white labor previous to the changes inaugurated in 1861.

Not more than half of the surface of this region is likely ever to be brought under the plow. As a general rule, the productive capacity of the better half of these lands may be put at three hundred pounds per acre of ginned cotton, although with intelligent and scientific culture, the average might easily be from four to five hundred pounds.

Let us now see what advantages the small farmer, who goes there for the purpose of engaging in the production of cotton, will have over the Western farmer. He can, in general, get a hundred acres of this land for a sum ranging somewhere between five hundred and two thousand dollars, according to the state of cultivation and quality of the buildings. Allowing five hundred more for stock and tools, he can commence cotton growing. On the supposition that his field force amounts to four hands, at least during the busy season, he will be justified in planting about thirty acres in cotton. These thirty acres should produce him twenty bales of cotton of four hundred pounds each. These, at twenty-five cents a pound, will bring him two thousand dollars, of which, say five hundred may go for labor, leaving him fifteen hundred dollars as profit. Beside the cotton crop, he can, with the usual Northern industry, produce food enough to keep all the stock necessary on such a place and bread for his family. As a rule, throughout this region, stock, unless hard-worked, do not need over three months' feeding; in many sections not two. Here we shall soon see Northern economy, the seed no longer wasted or misapplied, but the rich oil which composes twelve and a half per cent. of its weight expressed and turned to a useful purpose; the land no longer exhausted by a ruinous system of culture, but the manure

returned, and the cotton farm growing richer instead of poorer year by year. With increasing population manufactures will multiply, and most of the coarser fabrics be woven within sight of the field where the staple grows. Many years will elapse before the finer fabrics can be produced as successfully as they can be in the great mills of Manchester and Lowell.

The experience of the world, since the outbreak of our civil war, has established the great superiority of North America as *the cotton growing region of the globe.* The sceptre of King Cotton is not broken; it has merely shifted hands.

The possible future of cotton culture, as compared with the past, may be seen from the fact, that of all this vast region which has been so minutely described, only a very small fractional part has ever been converted into cotton fields. There are sixty-four squares on a checker-board. Now suppose the cotton belt to be that checker-board, and the fields actually planted in cotton would represent but one square, that is, one sixty-fourth part only of the "cotton fields of America" are, properly speaking, *cotton fields.*

This statement will give a clearer conception than any figures of the comparative infancy of cotton culture in the United States. The sheep from whose fleeces mankind derive their warmest clothing, dot ten thousand hill-sides in all the temperate regions of the earth. The Silk-worm, from whose golden cocoon man makes his costliest fabric, is confined to no zone or belt. But for the material of our cheapest cloth the world looks to America. And here millions of acres of virgin and inexhaustible soil await the onward march of the grand army of labor, that shall level the forests, turn the prairie sod, plant, cultivate and gather the crop whose snowy fibre, twisted by billions of spindles, shall FORM THE CLOTHING OF THE RACE.

CHAPTER IX.

COTTON SEED, COTTON SEED OIL, COTTON SEED CAKE.

BY J. R. SYPHER, ESQ.

To every bale of cotton-lint, weighing 400 pounds, there are produced about 1400 pounds of seed. Though for many years no good use was made of the cotton seed that accumulated in great heaps about the gin-houses, it has long been known that the kernel of the seed is rich in oil. As early as 1826, a gentleman in the State of Virginia constructed a small machine by which he was enabled to express from crushed cotton seed a dark red oil, which, when burned in a common lard oil lamp, gave a fair light. No practical use was made of this discovery, and for many years the facts thus developed were known only to a few friends of the original experimenter. When, however, the extensive and successful production of cotton made cotton goods so very cheap that the production of flax, and, consequently, the supply of flax seed greatly fell away, the proprietors of linseed oil mills began to look about in search of some substitute upon which to employ their crushers and presses. "Pea-nuts," "castor beans," cotton seed, and many other articles, were tested.

These experimenters experienced difficulties which mechanical genius subsequently overcame. When the seed of Upland cotton comes from the gin, it is covered with a thick coat of short lint, which adheres strongly to the dry, hard pericarp that surrounds the kernel, or meat, in the seed. In the absence of any contrivance by which the lint-coating and pericarp could be removed, it was necessary to grind or crush the seed in an ordinary burr-stone, or iron mill, and to put the whole mass into the boxes of the press. The oil was easily forced from the broken seed, but the intermatting lint immediately absorbed the greater portion of it. In the experiments made

with the seed of Sea Island cotton, to which the lint does not adhere closely, and which, therefore, may be delivered from the gin as clean as the pericarp of a chestnut, a more satisfactory yield of oil was obtained. The result, however, was not of a character that would induce manufacturers to engage regularly in the production of cotton-seed oil. A few years later, mechanics constructed and patented machines that successfully removed the lint and pericarp from the kernel, after which, by means of a revolving screw, the hulled seed was separated from the trash.

About the year 1855, some of the largest linseed oil mills in the country were converted into cotton-seed oil mills, and very soon new and extensive establishments were erected expressly for the manufacture of this oil. The principal and most successful of these mills were located, one in Providence, R. I., one in St. Louis, two in New Orleans, and two in Memphis; of these the Providence, one of the New Orleans, and the St. Louis mills alone survived the war.

The supply of raw material for these establishments was drawn wholly from the immediate line of the great navigable water-courses. The mills at New Orleans, at Memphis, and that at St. Louis, readily contracted with the steamboat lines to carry cotton-seed at very low rates of freight on return trips, when other freight in that direction was very scarce; the Providence Company made similar contracts with sailing vessels from New Orleans and other ports, both along the Atlantic and on the Gulf Coast. There was never any lack of seed; for all these mills, running at their greatest capacity, could not consume the seed that could be delivered, conveniently, upon the banks of the Mississippi River and its lower tributaries.

The seed was purchased only by weight, and was usually contracted for at ton rates. The price varied, before the war, from four dollars to eight dollars per ton, delivered

in sacks upon the bank of the river, at some convenient landing; the sacks usually contained from 80 to 100 pounds, and were supplied by the manufacturers, who sent them to the planters. When cotton seed oil mills were first erected in the South, the planters, who had, previous to that time, been in the habit of allowing their cotton seed to rot about the gin-houses, were suddenly seized with the idea that this seed was a very valuable article of trade, and that the demand would be far beyond the supply; many, therefore, began to house and take care of the seed, and held large quantities at prices varying from eight to twelve dollars a ton; and, for a few years, the manufacturers paid as high as ten dollars per ton for the seed they consumed. But as soon as they learned what quantity of seed was produced for each bale of cotton that was grown they put down the price; and, in 1860, more seed was offered at five dollars per ton, than their mills could have consumed during the year.

A proper mill for the manufacture of oil and oil-cake from cotton seed, should consist of a substantial building having three and a half stories and basement, one hundred feet long by forty to fifty wide. The engine should have power in proportion to the proposed capacity of the factory — twenty horse-power, if two pairs of five-box hydraulic presses are used. The hydraulic presses must be placed on a firm foundation, carefully laid. Heaters and rollers are machines made by the same machinists that supply the presses and pumps. Of hullers, the machines that bear the same relation to oil that gins do to lint, there are two or three patterns that will do the work, though the best, because it is least liable to get out of order and has a much greater capacity than any other, is one invented by Abram J. Sypher, for some time an engineer in the United States Navy. This machine is in its appearance, in its operation, and manner of receiving seed, somewhat similar to a wheat thresher. The seed

is delivered into the huller by an endless canvass apron; it passes under a cylinder revolving at great speed, armed with steel blades, and surrounded about two-third's way by a concave box also armed with corresponding knives. As the seed is forced between these, the pericarp, or hull, is broken and forced from the kernel. The mass of crushed seed then falls into a great revolving sieve. The kernels, many of which are broken into fine pieces, pass through the meshes of the wire sieve, and the pericarp, to which the lint adheres, is carried away and delivered into the fire-room, where it is burned under the boilers, and affords a full supply of good fuel for the use of the establishment. The clean seed is now carried by means of a system of elevators to the attic story, and then passes down into the crushers or rollers. These consist chiefly of two rollers revolving towards each other with unequal velocity, so geared as to produce both a crushing and a tearing effect upon the seed. The meal, as the seed is now called, falls to the bin on the first floor, and is shoveled into the heater by the pressman's attendant. The heater is a short, double cylinder, so arranged as to heat the meal in the inner cylinder by steam, which circulates in the space between the inner and the outer walls. Here the meal is heated until the water is converted into steam and escapes; the hot meal is then placed in wedge-shape bags, made of woolen duck; these are placed in hair books, which slide into the boxes of the press. As soon as the pressman has filled all the books, the pump is set to working, and the tremendous power of the hydraulic press soon forces out the liquid oil in warm, gushing streams. Seven minutes up, and the press returns; the books are thrown out, the duck bags are stripped from the meal, now pressed into solid cakes, the cakes are set up in racks to dry, and thus the operation is completed.

From the seed which was thrown into the huller, two merchantable articles are produced at the press, crude

cotton seed oil, and cotton seed cake. After the oil has cooled down to atmospheric temperature, and the floating impurities have separated from it and settled to the bottom of the tank, it is of a deep red color, and weighs about seven and a half pounds to the gallon. This quality of oil found a market among oil refiners, who, usually by very simple processes, removed the mechanical impurities and destroyed the coloring matter so as to produce an oil of a rich olive color, sweet and agreeable to the taste. Much of this found its way to the tables of our first-class hotels and private families. As a substitute for olive oil, it has no equal, and when flavored by the addition of genuine olive it is much superior to any other adulteration yet produced. The chief consumers of the cotton seed oil, however, are the soap-makers. The oil was purchased by manufacturers in its crude state, and from it was produced almost every grade of soap, from the cheapest family, to pure white castile, and the finest and most highly perfumed toilet soaps. The Philadelphia manufacturers were among the first, and always the largest, consumers of cotton seed oil in soap-making. The single house of Thain & McKeone, afterwards McKeone, Van Haagen & Co., consumed more than one-half of all the cotton seed oil that was used under its true name and in a pure state. These gentlemen discovered a very simple and cheap method of refining and bleaching the oil, and were thus enabled to produce a quality of cotton seed oil as clear and as limpid as pure water. Every grade of the oil was thoroughly tested in this establishment, and efforts were made to apply it to every possible use. At one time the proprietors hoped to make it one of the most profitable articles of trade, but, after the most thorough and persistent trials, wherein it was used in making every quality of soap and in adulterating all of the vegetable and some of the heavier animal oils, tested as a lubricator, as an illuminator, as a paint oil mixed with linseed oil, and as

a table oil, its use was finally abandoned even at the price of fifty cents a gallon.

Practical soap makers say, the quantity of stearine contained in cotton seed oil is insufficient to take up the quantity of resin necessary to make a superior quality of family soap. In the manufacture of the finest qualities of fancy soaps, it seemed to be a first-class stock. But, after the soaps of all grades were packed in boxes and allowed to stand a few months, a dark brown liquid, of a gummy nature, would ooze from the bars and cakes, and the soap would become soft. It, therefore, was unsalable, and hence the use of cotton seed oil was abandoned. The ablest chemists in the country were employed to analyze the oil, and to discover, if possible, an agent that would destroy or neutralize this unmanageable element. These efforts of science were unsuccessful, though they were conducted under the patronage of one of the largest establishments in the country; soap-makers, therefore, concluded that a firm, durable soap could not be made from cotton seed oil.

At about this same time a series of experiments made with great care, by Mr. A. W. Harrison, manufacturer of various grades of soap, perfumery, extracts, ink and other articles, in Philadelphia, resulted much more favorably.

Mr. Harrison says:

"In the years 1860 and '61, I used large quantities of cotton-seed oil in the manufacture of family soap, and found it to possess peculiar and valuable qualities for that purpose.

"Considerable skill and careful manipulation are required for the production of *hard* soap from this oil; but, after many experiments, I succeeded in obtaining, uniformly and readily, a firm, solid, fine-grained soap, of a pale yellow or cream color, and of the highest quality. It gives, without the use of resin or any other foreign substance, a

thick, creamy lather, and possesses a detergent property superior to any other soap known.

"In order to test its washing qualities under the most adverse circumstances, I prepared a piece of coarse bagging by saturating it with grease from the wheel of a dray, rubbing it well into the fabric and drying it. I then made a strong, cold, salt brine, and in this liquid, with the cotton-seed oil soap, washed the bagging perfectly clean, with little labor, leaving the fabric uninjured. I know of no soap that will endure so severe a test.

"As a shaving soap it is unsurpassed for its rich and emollient lather. The oil used was clarified, of a pale straw color; some lots were almost colorless.

"My attempts to manufacture extemporaneous or "cold-made soap," invariably failed. A dark, gummy liquid, would exude from the soap after some weeks standing, which rendered it unsalable."

Mr. Harrison believes refined cotton-seed oil, at sixty cents a gallon, to be the cheapest and most durable soap stock known to commerce. He continued to use it freely as long as it could be obtained in large quantities, and, up to the time of the beginning of war of the rebellion, was the second largest consumer in this country.

Notwithstanding the variety of uses to which this oil was applied, and the quantities purchased by a few large dealers and manufacturers, the demand was never fully up to the supply; and the oil pressers always worked against a dull market, and often were overstocked with oil, for which they could find no purchasers. At this time about 50,000 tons of seed were consumed by the oil mills, yielding, at the rate of 30 gallons per ton, about 1,500,000 gallons of crude oil. Estimating the cotton crop for such portions of the country as are most accessible to cheap transportation at 3,000,000 bales, the seed available for oil-making would amount to 1,500,000 tons, yielding 45,000,000 gallons of oil annually. The first and great

necessity therefore is to find a more general use for this oil, in which the cotton region so greatly abounds. As an illuminator it is not equal to lard oil; mixed with petroleum it makes a medium lubricator; painters have used it either pure or mixed as a substitute for linseed oil; oil dealers have mixed it with lard oil, with almond, pea-nut, cocoa-nut, and with olive oil; but this surreptitious mode of treating it in trade gave it a bad name in commerce, and hence only small quantities found sale under the name of cotton-seed oil, except to a few soap-makers, who purchased it and used it in its true name and character.

The refining process is simple, and, after a little practice, may be successfully conducted by any one possessed of ordinary skill. The agent employed to remove the impurities is a solution of the soda ash of commerce, having a strength of about 30 degrees. The oil is put into a large metal tank, supplied with steam pipes for heating, and with proper apparatus to keep the oil thoroughly agitated. The caustic solution and the oil, when mixed, should be at the temperature of the atmosphere in the factory, and about one gallon of the solution should be put into ten gallons of oil, mixed in small quantities, at intervals of a few minutes. The mixture should then be slowly heated up to 100 degrees, then allowed to cool. During the pouring in of the solution, and while the mixture is being heated, and until the temperature has gone down nearly to its natural state, the stirring apparatus should be kept in motion. The oil should then be left in the tank at least 24 hours, that the impurities may settle to the bottom; then, by a faucet inserted at a distance of several inches from the bottom, the refined oil may be drawn into a wooden tank placed in the basement, where it will sink to a still lower temperature, and deposit a purer sediment in the bottom of the tank. If the process has been conducted with care, the refined oil will be perfectly clear, and of a rich olive color. The price of this quality of oil

before the war rated at from sixty to seventy-five cents per gallon.

The ground seed, from which the oil has been expressed, is known to commerce as "cotton-seed cake," and is consumed principally in feeding cattle. It is classed by general feeders with linseed cake, though chemists and scientific dairymen claim for it a superiority. When fed to milch cows, it increases the quantity and improves the quality of the milk; it is a rapid flesh former, and the manure of the stock yard where cotton seed meal is fed is of a very superior quality.

The following observations were made by Professor Voelcker, of England, on the result of an analysis of several specimens of thin decorticated American cotton-seed cake:

1st.—The proportion of oil in all the specimens is higher than in the best linseed cake, in which it is rarely more than 12 per cent., and 10 per cent. may be taken as average. As a supplier of food, cotton-cake is therefore superior to linseed-cake.

2d.—The amount of oil in the several specimens differs to the extent of 5½ per cent.—say from No. 7, 13.50, to No. 2, 19.19.

3d.—Decorticated cake contains a very high and much larger percentage of flesh-forming matters than linseed-cake, and it is therefore proper to give to young stock and milch cows. The dung, also, is very valuable.

4th.—In comparison with linseed, there is much less mucilage and other respiratory matter in cotton-cake. This is compensated by the larger amount of oil.

5th.—The proportion of indigestible woody fibre in decorticated cotton-cake is very small, and not larger than in the best linseed-cake.

6th,—And lastly, it may be observed that the ash of

cotton-cake is rich in bony materials, and amounts to about the same quantity as is contained in other oily cakes.

Dairymen and stock feeders, in this country, where corn and root vegetables are abundant and cheap, were slow to try experiments, and hence could not be induced to use the cotton-seed cake. The great bulk of it was therefore shipped to Liverpool, England, where it found ready sale at from forty to forty-seven dollars per ton. Small quantities were fed in this country, and a few manufacturers of fertilizers used it to mix with other ingredients.

The cake can be ground into fine meal in a corn and cob mill, and, in this state, if mixed with cut straw or corn stalks and salted, makes a very superior feed for cattle. This is the proper mode of treating it. The farmers and planters in the South might thus, at small expense, convert the corn stalks and cobs of their wide fields into stacks and bins of forage, which, when made palatable to their animals, and enriched by the addition of cotton-seed meal and salt, would furnish ample supplies during the winter and spring months, and save vast sums of money now spent in the purchase of hay and oats. At a low estimate, the value of the cotton seed which hitherto has annually been destroyed in the Southern States would have amounted to not less than $7,000,000. This crude material might be so transformed by simple processes as to greatly increase its value, and supply to the country, hitherto impoverished by its destruction, just what it most needs. If the discoveries which Mr. A. W. Harrison claims to have made can become known and available to all soap-makers, then, at no distant time, there will be made from the cotton-seed the oils for ordinary uses, the soap for family and toilet purposes; the cake meal will supply good forage for the plantation stock, and a superior fertilizer for the soil; and the ashes of the hulls burned under the boilers, will yield a caustic solution, that can be used both in refining the oil and in the manufacture of soap. All

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